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(54) **AXIALLY SYMMETRIC LED LIGHT BULB**

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(51) **Int. Cl.**

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F21V 3/04	(2006.01)
F21V 3/02	(2006.01)
F21K 9/232	(2016.01)
F21K 9/66	(2016.01)
F21Y 115/10	(2016.01)

(52) **U.S. Cl.**
CPC ***F21V 3/04*** (2013.01); ***F21K 9/232*** (2016.08); ***F21K 9/66*** (2016.08); ***F21V 3/02*** (2013.01); *F21Y 2115/10* (2016.08)

(58) **Field of Classification Search**
CPC F21V 3/02; F21V 3/04; F21K 9/232
See application file for complete search history.

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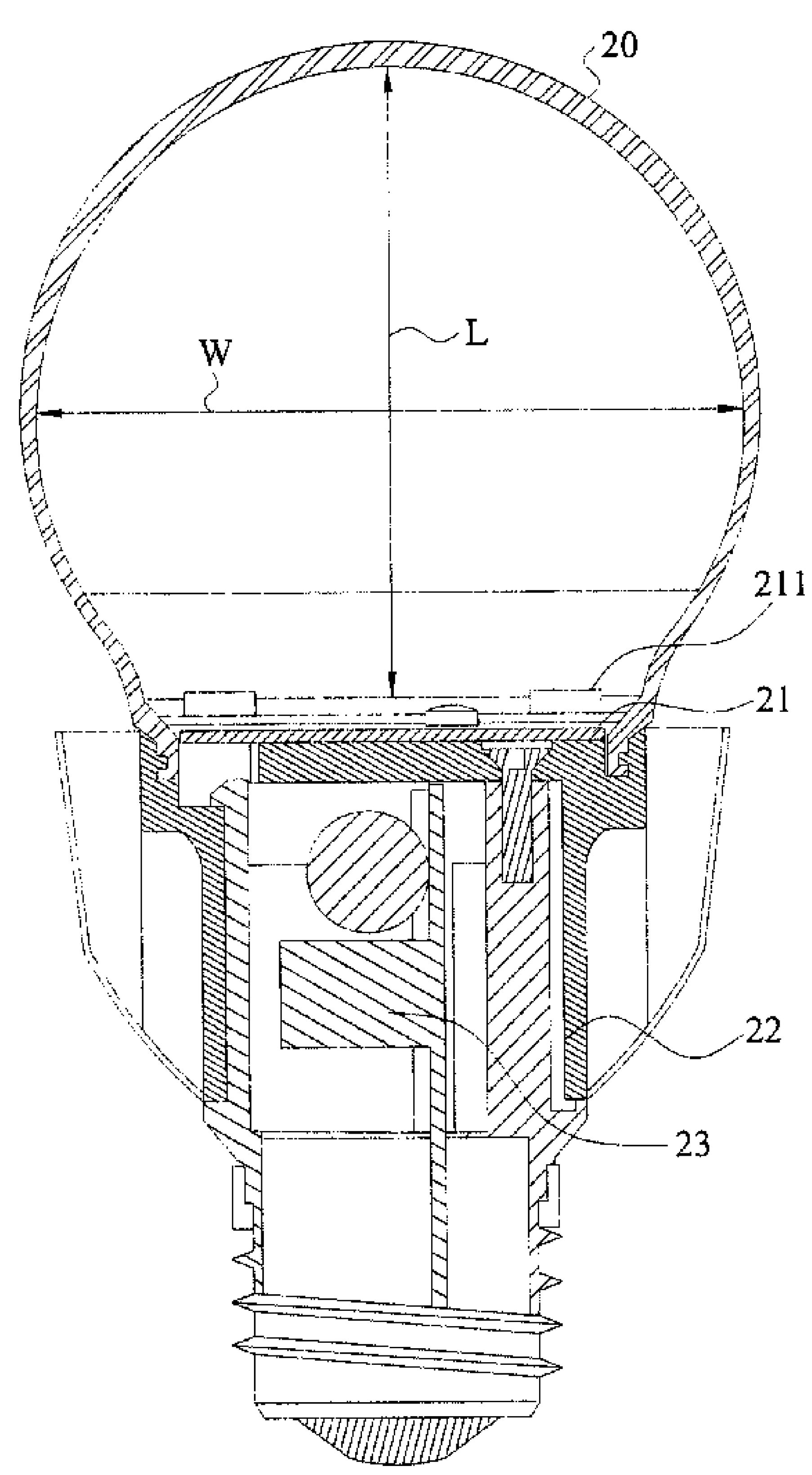
(57) **ABSTRACT**

An axially symmetric LED light bulb includes a lamp shade, a substrate and a connecting seat. The substrate installed on the connecting seat includes plural LED light sources. The lamp shade has an edge connected to the connecting seat, and the substrate is covered inside the lamp shade. The lamp shade has an unequal thickness with a thicker top and thinner sides. The axially symmetric LED light bulb provides excellent light uniformity and wide-angle illumination.

8 Claims, 10 Drawing Sheets



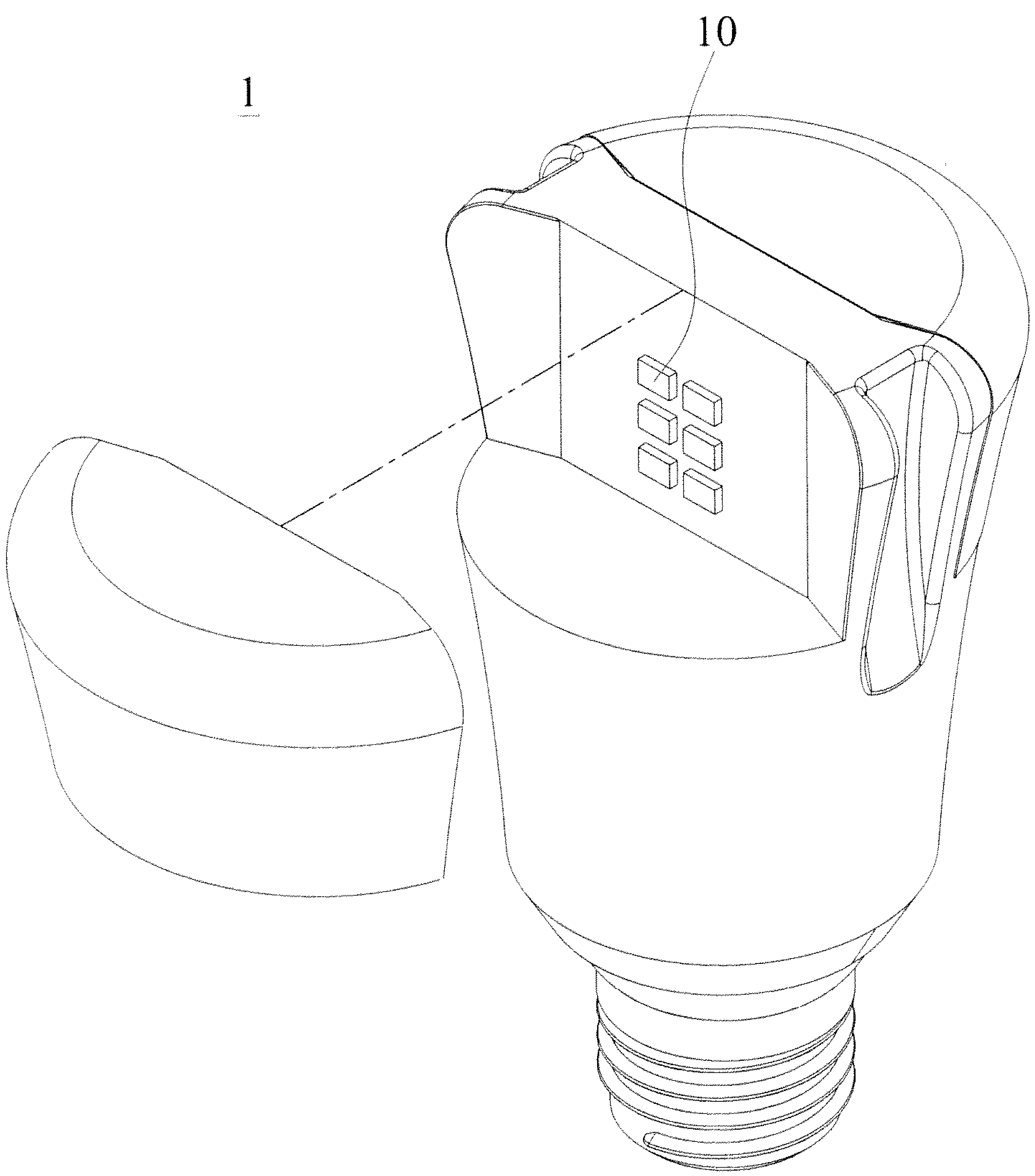


Fig. 1(PRIOR ART)

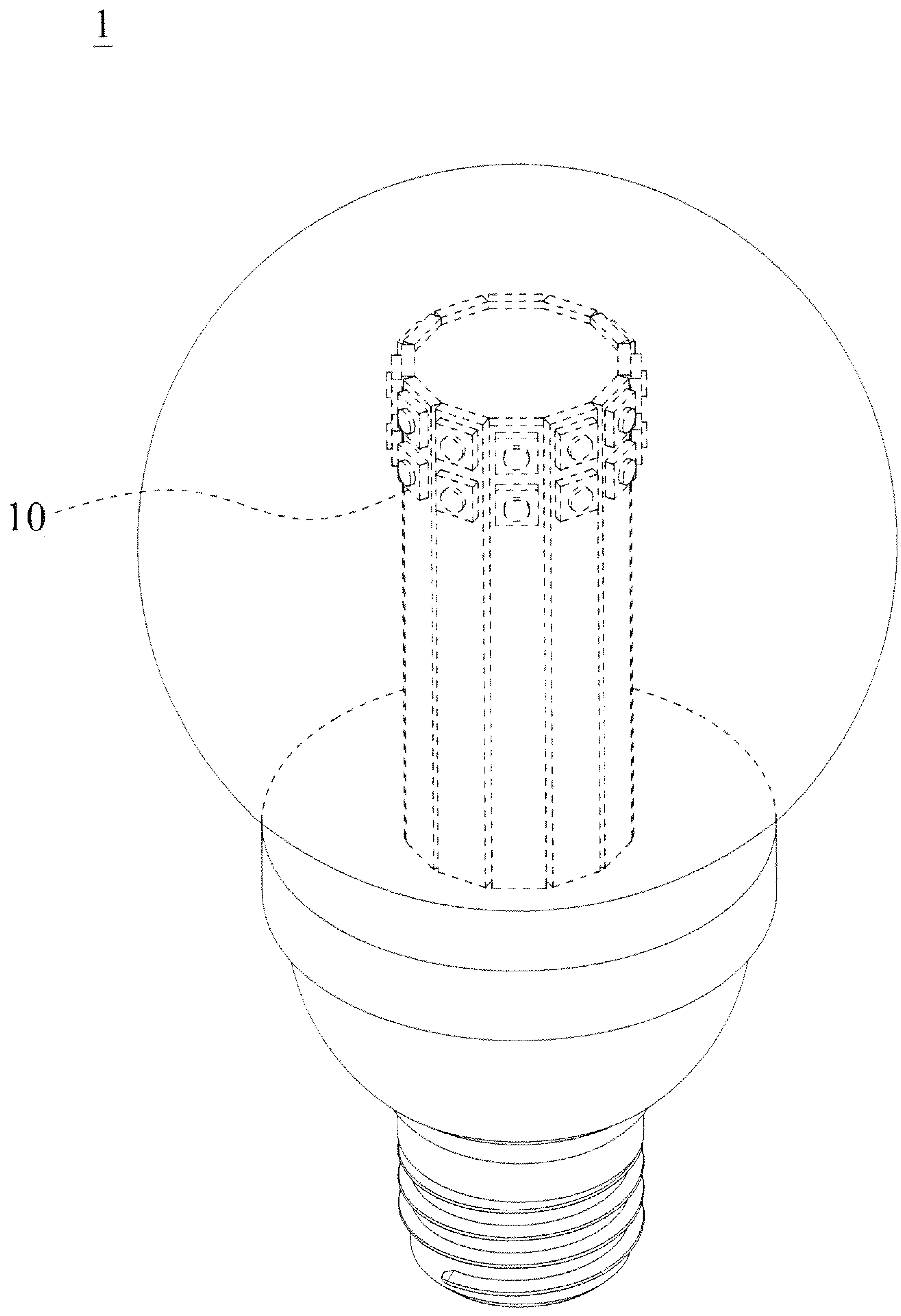


Fig. 2(PRIOR ART)

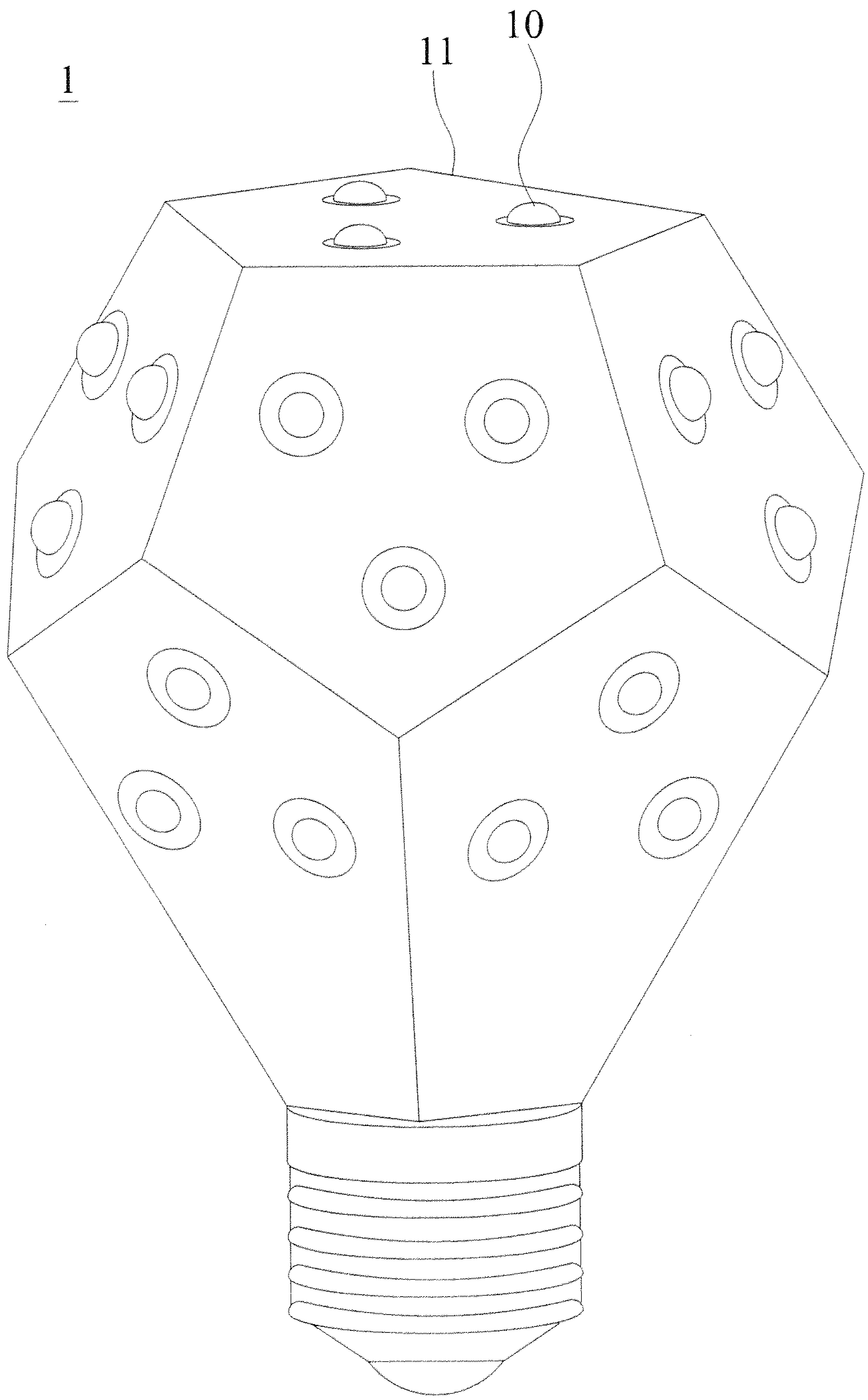


Fig. 3(PRIOR ART)

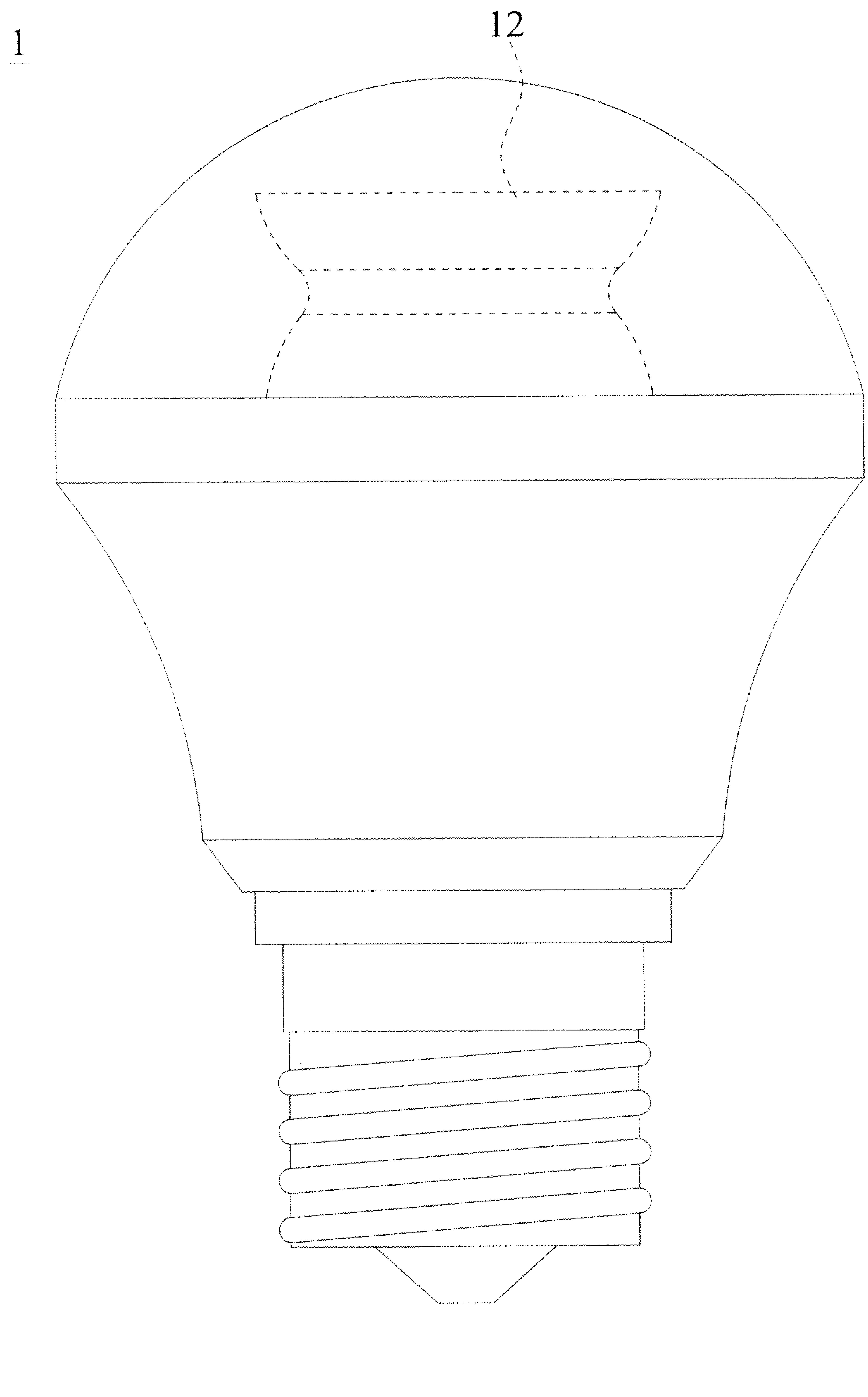


Fig. 4(PRIOR ART)

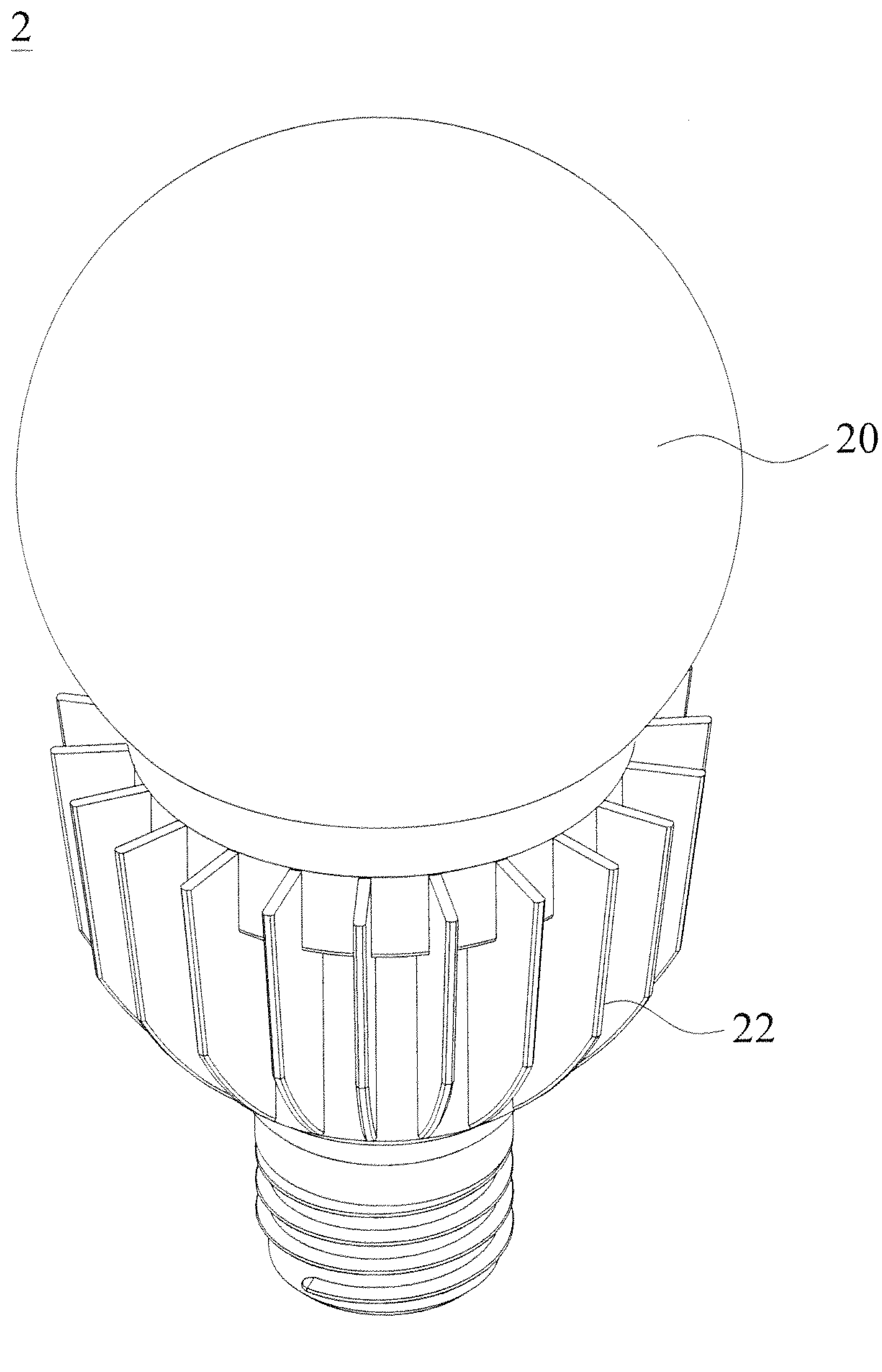


Fig. 5

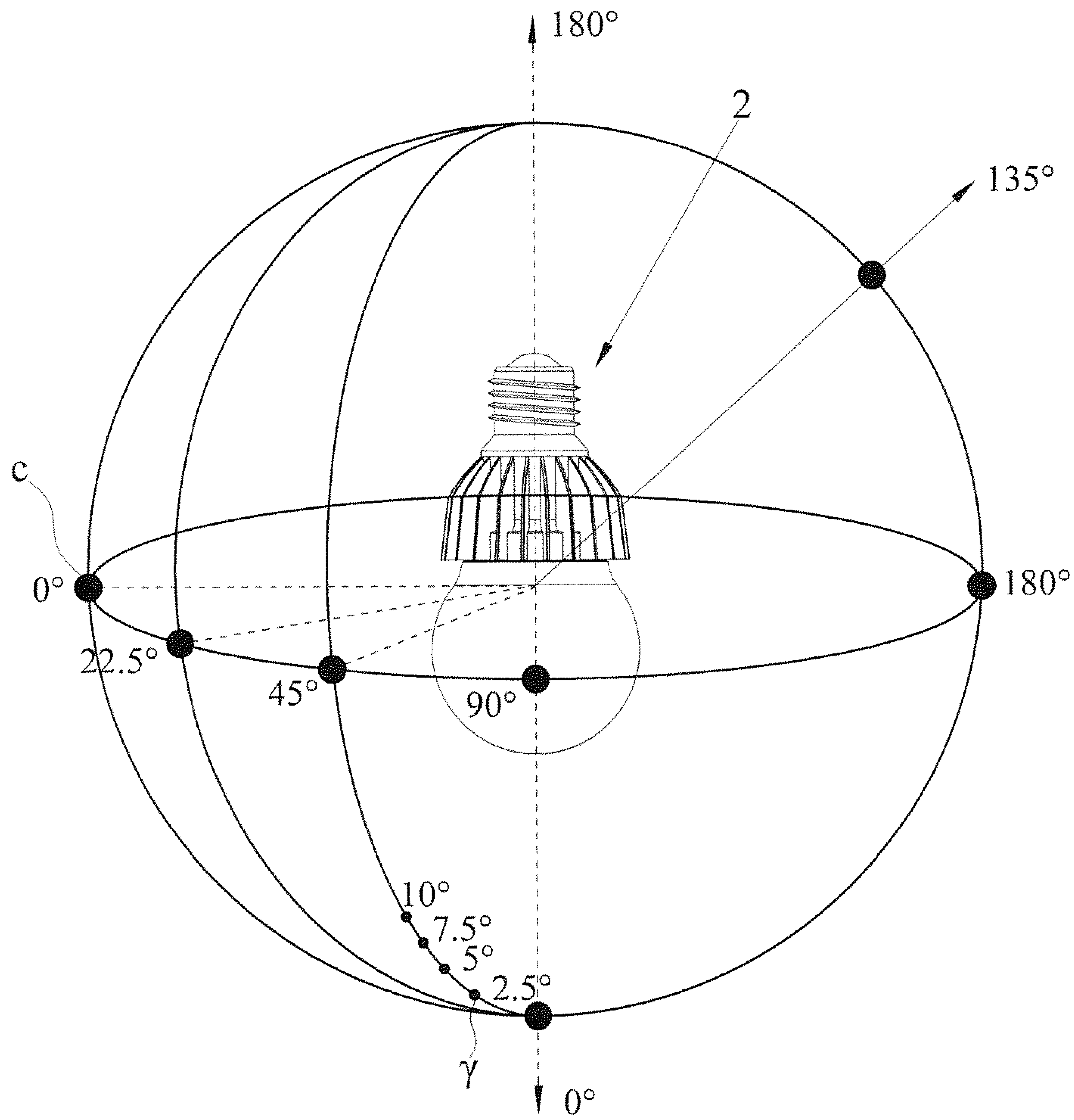


Fig. 6

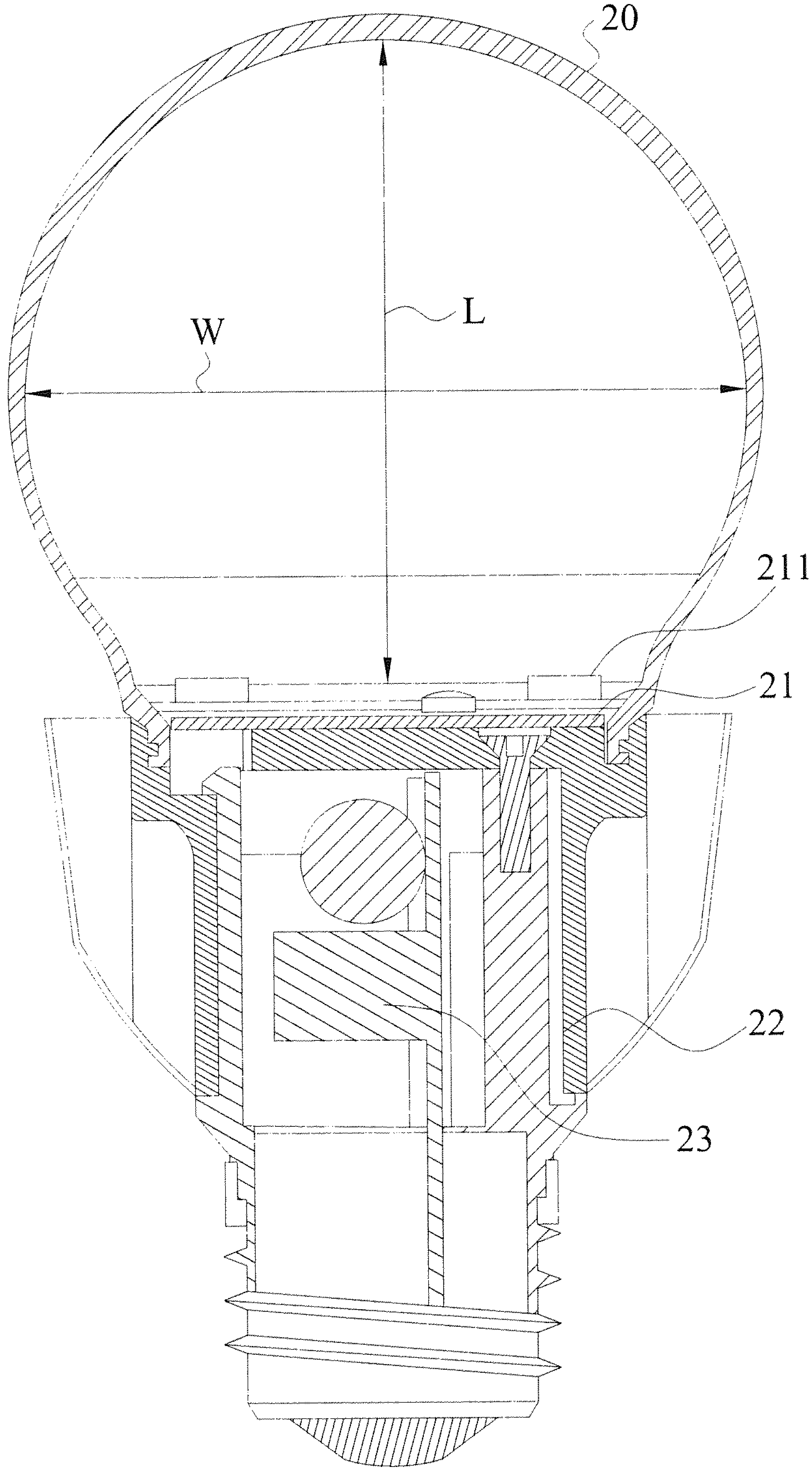
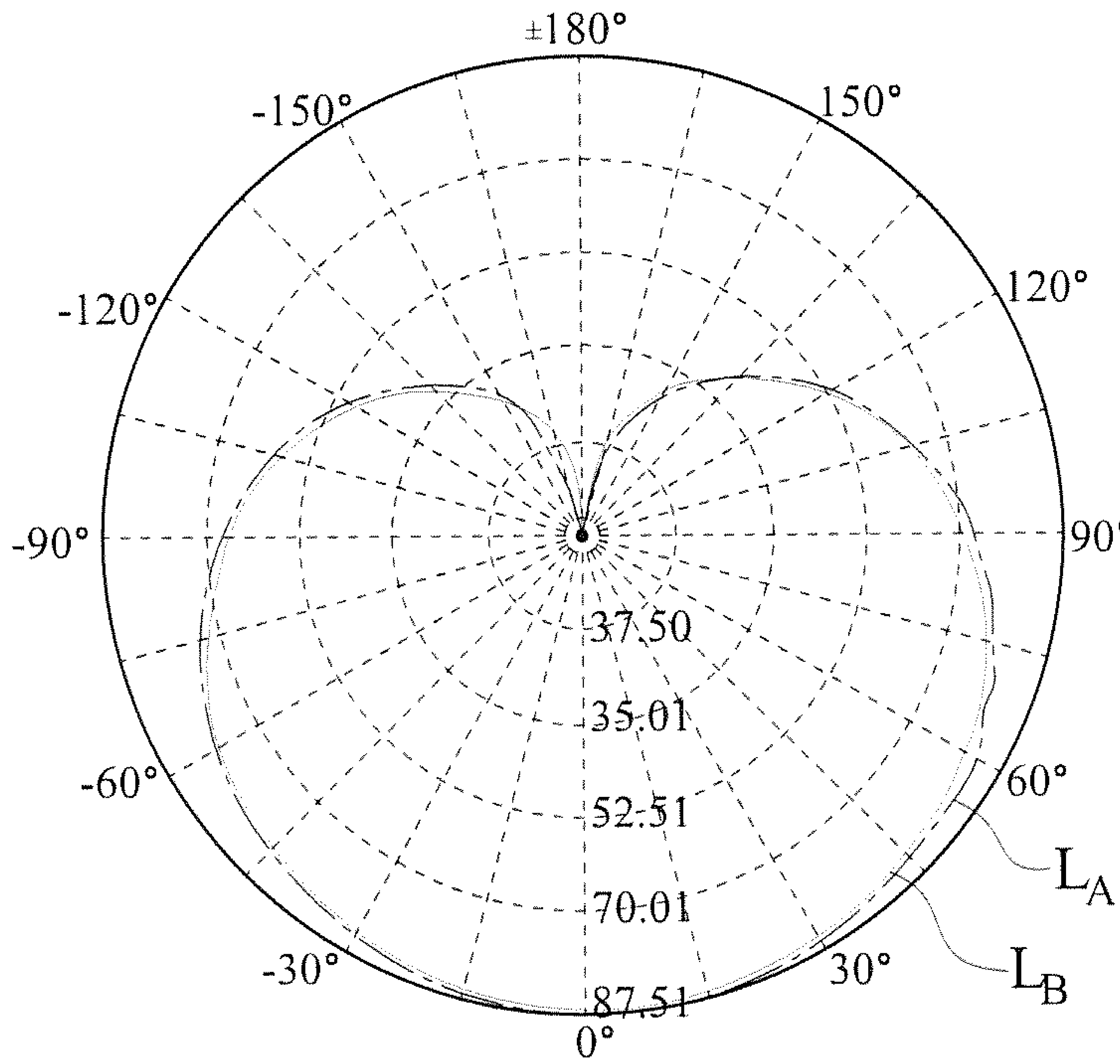


Fig. 7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L_A
L_B

Fig. 8

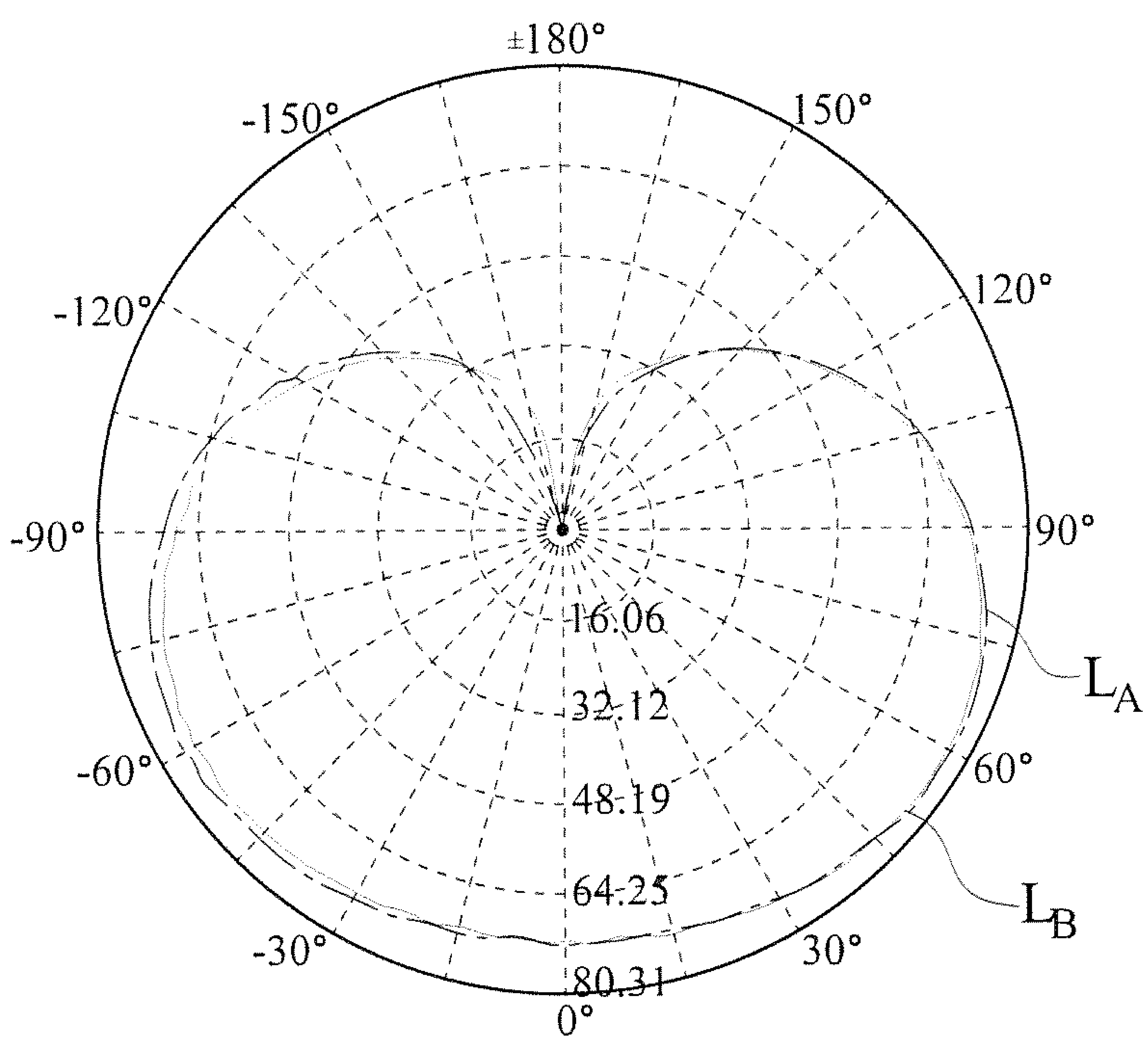
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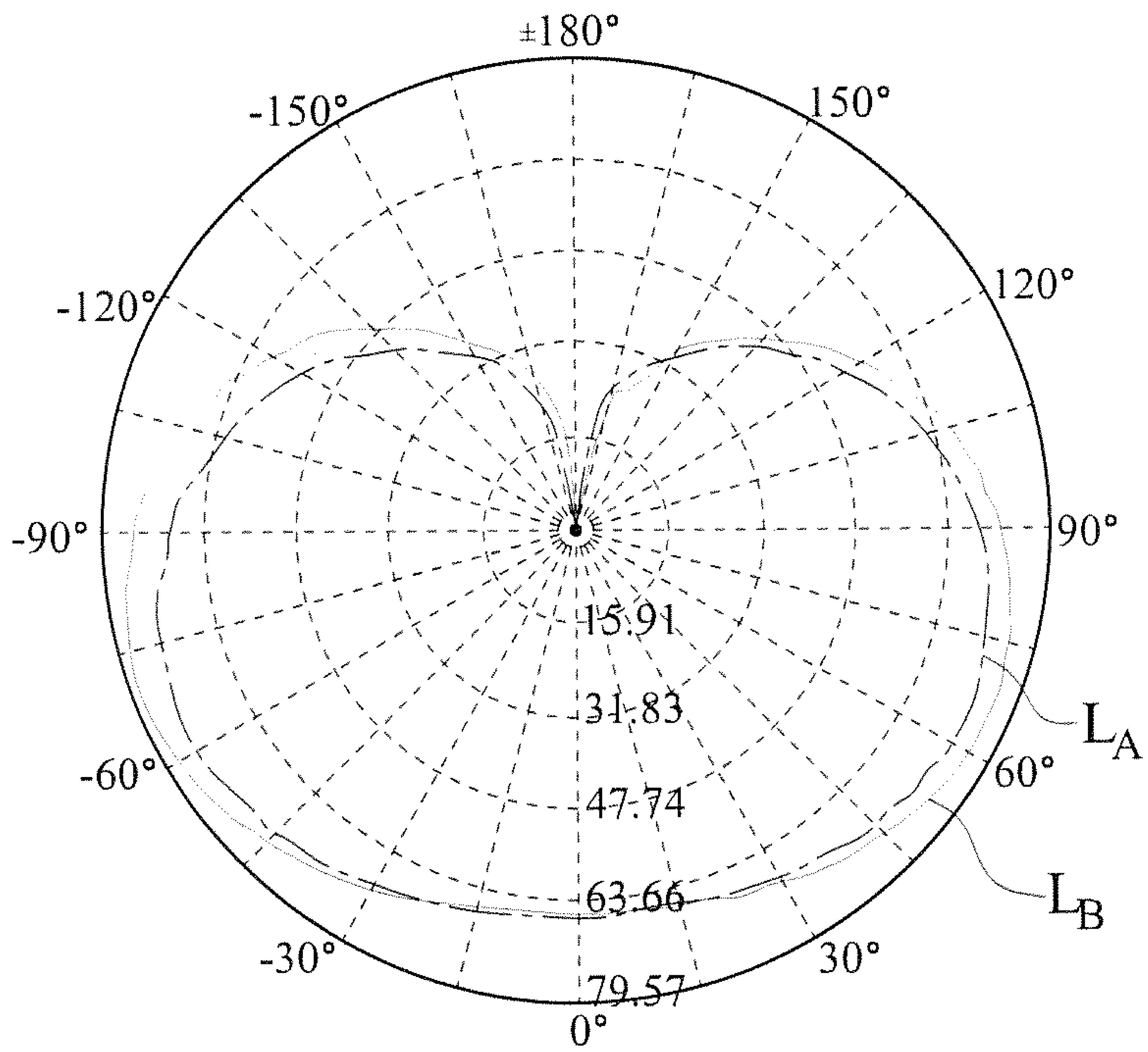
Fig. 9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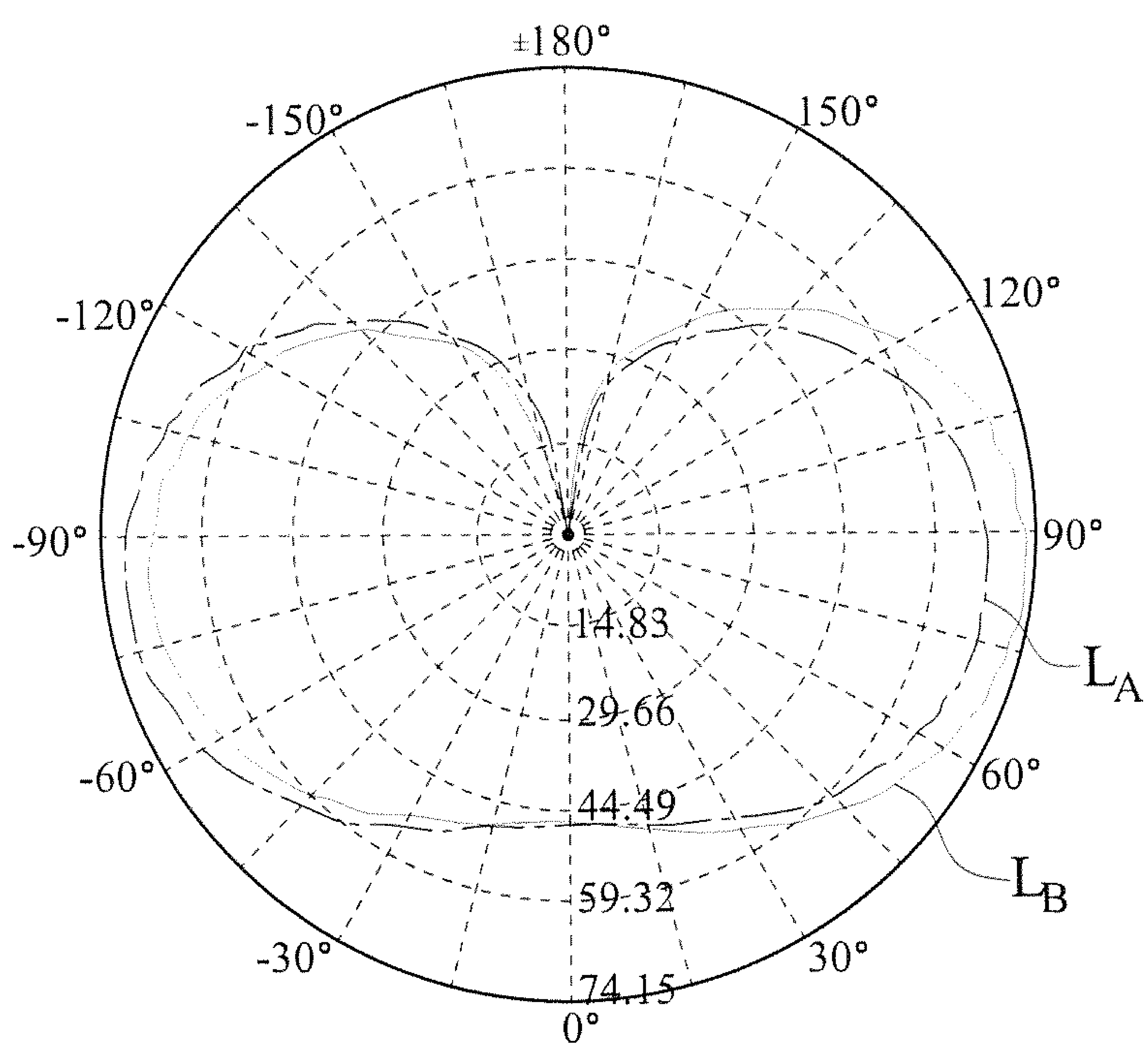
L_A
L_B

Fig. 10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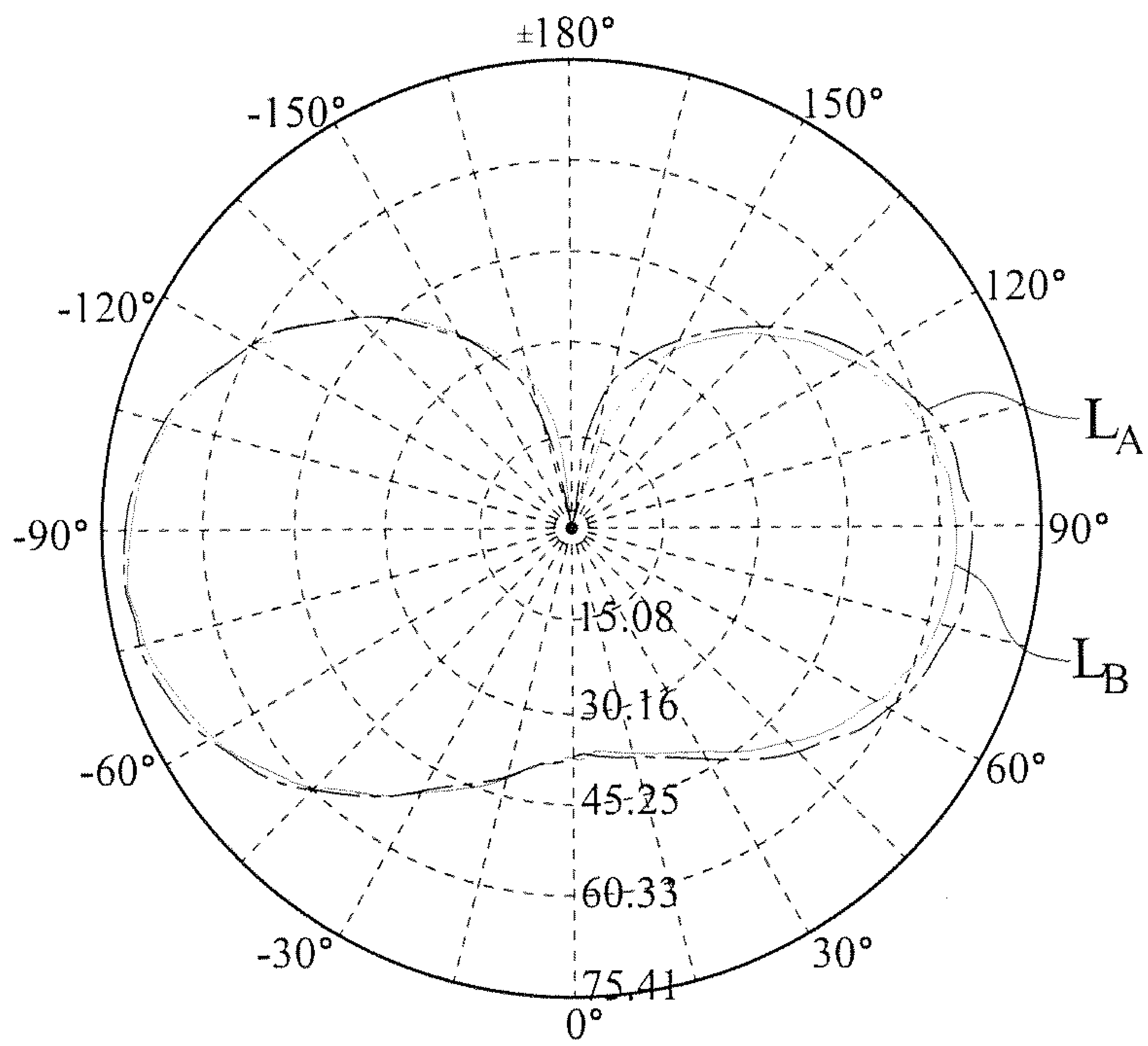
L_A
L_B

Fig. 11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30.16
45.25
60.33
75.41
L_A
L_B

Fig. 12

AXIALLY SYMMETRIC LED LIGHT BULB

CROSS-REFERENCE TO RELATED APPLICATIONS

This non-provisional application claims priority under 35 U.S.C. §119(a) on Patent Application No(s). 104207617 filed in Taiwan, R.O.C. on May 18, 2015, the entire contents of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of LED light bulbs, and more particularly to an axially symmetric LED light bulb with the features of high light uniformity and wide-angle illumination range.

2. Description of the Related Art

LED with the features of high efficiency, high color rendering, environmental friendliness, energy saving and long service life is used generally used as a light source for various illumination lamps.

For example, the conventional light bulb at an early stage uses a tungsten filament as the light source, wherein electricity is passed through the tungsten filament, and the tungsten filament is heated to incandescence to emit light for the illumination purpose due to the resistance of the tungsten filament. The light emission of such light bulb is similar to that of a light source, so that when such light bulb is used for illumination, a luminous efficacy of 360-degree full-circumferential radiation is achieved. A s described above, LEDs are used extensively as a light source for lamps, but most of the light sources in the present LED light bulbs are designed with a light emitting surface facing upward and perpendicular to the light emitting angle. In the meantime, the shape and structure of the light bulb provides a screening effect to the light, so that the light emitting angle of the conventional LED light bulb is usually not too large, and the light is too concentrated and comes with a narrow light emitting angle. With the aforementioned restrictive properties including the light emitting angle and the total light lumen of the LED, the conventional LED light bulb is unable to achieve the full-circumferential uniform illumination effect like the conventional incandescent lamps with the feature of a uniform wide-angle light emission. Therefore, the conventional LED light bulb still requires improvements of the illumination angle and the uniformity of light to achieve a better illumination performance of the LED light bulb.

To improve the luminous efficacy of the LED light bulb, most manufacturers adopt a 3D light source to increase the illumination angle of the LED light bulb, such that the LED light bulb can achieve the effect of a full-circumferential illumination similar to that of the tungsten filament. With reference to FIGS. **1** to **4** for various types of conventional LED light bulbs **1** available in the market, the LED light bulb **1** adopts an LED light source **10** arranged in a vertical direction, such that the light output angle of the light emitted from the LED light bulb **1** may be increased. In FIG. **2**, the LED light bulb **1** also adopts a vertically arranged LED light source **10**. Compared with the LED light bulb **1** as shown in FIG. **1**, the LED light bulb **1** as shown in FIG. **2** uses a greater number of LED light sources **10**, so that a 3D light source with more surfaces produces and outputs more lights in different angles. In FIG. **3**, the LED light bulb **1** is assembled by using a multi-angle circuit substrate **1**, such that the lights of the LED light sources **10** may be emitted to different angles. In FIG. **4**, a secondary optical lens **12** is added to the top of the LED light source **10** to achieve the effects of increasing the illumination angle and providing the full-circumferential radiation. However, the aforementioned method is commonly adopted in the LED light bulb with a light emitting surface facing upward, and it is necessary to design and consider the LED light source **10** again or even re-design the area for installing the LED light source **10** whenever the installation direction of the LED light source **10** is adjusted. In the LED light bulb **1** as shown in FIG. **1**, there are just two areas for installing the LED light source **10**, and thus there still exists an illumination angle unreachable by light. In the LED light bulb **1** as shown in FIGS. **2** and **3**, such LED light bulb **1** is the present common 3D light source design. To improve the light output angle of the LED light source **10**, it is necessary to increase the quantity of LED light sources **10**, so that the quantity of lead frame or circuit substrates **12** for installing the LED light source **10** is increased accordingly, and the manufacturing and assembling costs are increased significantly. Although the light source is a 3D light source, the shape of the aforementioned LED light bulb **1** affects the light emitting angle of the LED light source **10**, so that different LED light bulbs **1** require the lead frame or circuit substrates **11** which are designed one by one to comply with the required light output angle. In FIG. **4**, some manufacturers adopt the method of installing an additional secondary optical lens **12** outside the LED light source **10**, such that the illumination angle of the light is increased by the secondary optical lens **12**. However, this method requires the installation of other components to the LED light bulb **1**, and thus the manufacturing cost and assembling time are increased.

Therefore, the present methods adopted for improving the light output angle and uniformity of the LED light bulb increase the manufacturing cost, the assembling time and the level of difficulty of the design. Although these methods may overcome the issue of a low luminous efficacy of the LED light bulb, yet they still have the following drawbacks. Therefore, the inventor of the present invention provides an axially symmetric LED light bulb in hope of overcoming the drawbacks of the conventional LED light bulb and improving the illumination angle and light uniformity of the LED light bulb with planar light emission to omit the complicated design of the light source and lower the production cost.

SUMMARY OF THE INVENTION

Therefore, it is a primary objective of the present invention to provide an axially symmetric LED light bulb capable of adjusting the upward LED light output angle with respect to the light emitting surface and homogenizing the overall light uniformity to provide the wide-angle light emitting angle and excellent illumination uniformity similar to those of a full-circumferential radiation.

To achieve the aforementioned and other objectives, the present invention provides an axially symmetric LED light bulb comprising a lamp shade, a substrate and a connecting seat, and the substrate being installed on the connecting seat and having a plurality of LED light sources, and an edge of the lamp shade being coupled to the connecting seat and the substrate being covered inside the lamp shade, characterized in that the lamp shade has an unequal thickness, and the thickness of the top of the lamp shade is greater than the thickness of the lateral side of the lamp shade, such that the LED light source is arranged at a polar coordinate origin position, and when the illumination of LED light source points at a direction towards the polar coordinate **0** degree and after the light of the LED light source passes through the lamp shade, at least 5% of the total flux of the LED light source is obtained at the polar coordinate position from 135 degrees to 180 degrees. The axially symmetric LED light bulb **2** further satisfy a illumination relation (|I−Iavg|/Iavg) <25%, wherein I is an intensity of light of at least 90% of a spatial position between 0 degree to 135 degrees of the polar coordinate positions, and Iavg is an average light intensity situated between the polar coordinate position from 0 degree to 135 degrees.

Wherein, the ratio of the thickness of the lamp shade at the polar coordinates from +30 degrees to −30 degrees to the thickness of the lamp shade at the polar coordinates from +90 degrees to +30 degrees and from −90 degrees to −30 degrees is equal to (1.8−3):1. Within this range, the present invention meets the conditions of the optimal light uniformity and wide-angle illumination angle and achieves the best lighting performance.

In addition, the cross-sectional edge of the inner side of the lamp shade is arc-shaped or is a curve with a plurality of turning points, and the curve is bilaterally symmetrical, and the distance from the top end of the inner side of the lamp shade to the substrate is equal to 50 mm-60 mm, and the maximum width of the external periphery of the lamp shade is equal to 58 mm-70 mm.

In summation of the description above, the axially symmetric LED light bulb of the present invention effectively improves the luminous efficacy of a light bulb that uses LED as a light source, and the lamp shade with unequal thickness reduces a too-strong light of the LED light source generated at specific angles, so that the light of the light bulb at a predetermined light output angle is more uniform and the illumination angle is wider.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view of a first conventional LED light bulb;

FIG. **2** is a schematic view of a second conventional LED light bulb;

FIG. **3** is a schematic view of a third conventional LED light bulb;

FIG. **4** is a schematic view of a fourth conventional LED light bulb;

FIG. **5** is a perspective view of an axially symmetric LED light bulb of a preferred embodiment of the present invention;

FIG. **6** is a schematic view showing the polar coordinate space of an axially symmetric LED light bulb of a preferred embodiment of the present invention;

FIG. **7** is a cross-sectional view of an axially symmetric LED light bulb of a preferred embodiment of the present invention;

FIG. **8** shows the light pattern of a lamp shade of an axially symmetric LED light bulb of a preferred embodiment of the present invention with a thickness ratio of 1:1;

FIG. **9** shows the light pattern of a lamp shade of an axially symmetric LED light bulb of a preferred embodiment of the present invention with a thickness ratio of 1.7:1;

FIG. **10** shows the light pattern of a lamp shade of an axially symmetric LED light bulb of a preferred embodiment of the present invention with a thickness ratio of 1.8:1;

FIG. **11** shows the light pattern of a lamp shade of an axially symmetric LED light bulb of a preferred embodiment of the present invention with a thickness ratio of 3:1; and

FIG. **12** shows the light pattern of a lamp shade of an axially symmetric LED light bulb of a preferred embodiment of the present invention with a thickness ratio of 3.1:1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The technical content of the present invention will become apparent with the detailed description of preferred embodiments and the illustration of related drawings as follows. It is noteworthy that same numerals are used for representing the same respective elements respectively for simplicity.

With reference to FIGS. **5**, **6** and **7** for a perspective view of an axially symmetric LED light bulb, a schematic view showing the polar coordinate space of the axially symmetric LED light bulb, and a cross-sectional view of the axially symmetric LED light bulb in accordance with a preferred embodiment of the present invention respectively, the axially symmetric LED light bulb **1** comprises a lamp shade **20**, a substrate **21** and a connecting seat **22**, and the substrate **21** is disposed on the connecting seat **22** and includes a plurality of LED light sources **211** used as a light source, and a power supply element **23** is installed in the connecting seat **22** for supplying electric power to the LED light sources **211**, and an end of the lamp shade **20** is connected to the connecting seat **22**, and the substrate **21** is covered inside the lamp shade **20**.

The axially symmetric LED light bulb **2** is characterized in that the lamp shade **20** has an unequal thickness, wherein the thickness of the top of the lamp shade **20** is greater than the thickness of the lateral side of the lamp shade **20**, so that the lamp shade **20** comes with an unequal thickness. Please refer to FIG. **6**, for purpose of explanation, the LED light sources **211** are arranged at an origin position of a polar coordinate, and the LED light sources **211** are pointing in a direction toward the polar coordinate 0 degree. After the lights of the LED light sources **211** pass through the lamp shade, the flux between the polar coordinate from 135 degrees to 180 degrees is equal to at least 5% of the total flux of the LED light source. The axially symmetric LED light bulb **2** further satisfy a illumination relation (|I−Iavg|/Iavg) <25%, wherein I is an intensity of light of at least 90% of a spatial position between 0 degree to 135 degrees of the polar coordinate positions, and Iavg is an average light intensity situated between the polar coordinate position from 0 degree to 135 degrees, so that the light emission of the axially symmetric LED light bulb **2** has better uniformity and wider illumination range to achieve the 360-degree full-circumferential radiation effect. The greater the thickness of the lamp shade **20**, the better is the light reflection effect. In other words, a greater thickness has a better chance to achieve the full-circumferential radiation effect. Meanwhile, the light intensity and brightness of the LED light sources **211** projected onto the lamp shade **20** will become weaker accordingly, so that the light of the LED light sources **211** has an increasingly weaker light intensity and an increasingly wider illumination angle as the thickness of the lamp shade **20** increases. On the hand, the light of the LED light sources **211** has an increasingly stronger light intensity and an increasingly narrower illumination angle as the thickness of the lamp shade **20** decreases. Obviously, the light shows a progressive change of intensity and illumination angle with the thickness of the lamp shade **20**. Therefore, the light emitting angle and the light intensity of the LED light sources **211** may be changed by adjusting the thickness of the lamp shade **20**. To achieve a better illumination effect of the axially symmetric LED light bulb **2** to meet the aforementioned flux and light intensity requirements, the thickness ratio of the lamp shade **20** may be further defined.

The following data are obtained from optical experiments, and these data relate to the thickness ratios of the lamp shade **20** (hereinafter referred to as "thickness ratio") at the polar coordinate from +30 degrees to −30 degrees with respect to the polar coordinate +90 degrees to +30 degrees and −90 degrees to −30 degrees. The thickness of the lamp shade **20** at the polar coordinate from +30 degrees to −30 degrees and the thickness of the lamp shade **20** at the polar coordinate from +90 degrees to +30 degrees and from −90 degrees to −30 degrees are obtained after conducting the optical experiments, and if their ratio is equal to (1.8−3):1, the aforementioned restrictive condition of the flux and the light emitting intensity is met, and the axially symmetric LED light bulb **2** achieves the effects of full circumferential luminous efficacy and light uniformity.

Firstly, optical experiments on testing whether or not the light emitting intensity satisfies the relation (|I−Iavg|/Iavg) <25% are conducted repeatedly, and the experiment results are listed in Tables 1-1 to 1-5. Wherein, Tables 1-1 to 1-5 show the numeric values of the measured light intensity at the polar coordinate positions (γ,c) and the measured average light intensity Iavg as shown in FIG. **6**.

Table 1-1 lists the experiment data provided that the thickness ratio of the lamp shade **20** is 1:1 and shows the light emitting intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees and the numeric value of (|I−Iavg|/Iavg) of the average light intensity Iavg; Table 1-2 lists the experiment data provided that the thickness ratio of the lamp shade **20** is 1.7:1, and shows the light emitting intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees and the numeric value of (|I−Iavg|/Iavg) of the average light intensity Iavg; Table 1-3 lists the experiment data provided that the thickness ratio of the lamp shade **20** is 1.8:1, and shows the light emitting intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees and the numeric value of (|I−Iavg|/Iavg) of the average light intensity Iavg; Table 1-4 lists the experiment data provided that the thickness ratio of the lamp shade **20** is 3:1, and shows the light emitting intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees and the numeric value of (|I−Iavg|/Iavg) of the average light intensity Iavg; and Table 1-5 lists the experiment data provided that the thickness ratio of the lamp shade **20** is 3.1:1, and shows the light emitting intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees and the numeric value of (|I−Iavg|/Iavg) of the average light intensity Iavg, wherein the numeric values listed in each table is in the unit of %.

TABLE 1-1

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	17.91	18.03	17.91	17.85	17.91	18.21	18.09	18.26	18.44	18.03	17.91	17.85	17.91	18.21	18.09	18.26	17.91
2.5	18.44	17.91	17.62	17.58	19.31	19.73	19.94	22.65	23.42	25.03	25.72	26.71	24.66	23.53	22.08	19.26	18.44
5	18.38	17.91	17.56	17.64	19.37	19.61	19.88	22.35	23.30	24.78	25.66	26.27	24.60	23.28	22.08	18.96	18.38
7.5	18.32	17.68	17.56	17.70	19.26	19.55	20.06	22.04	23.05	24.60	25.28	26.01	24.22	23.28	21.96	18.96	18.32
10	18.09	17.68	17.39	17.41	19.20	19.43	19.71	21.80	22.87	24.29	24.84	25.70	23.73	22.91	21.65	18.90	18.09
12.5	18.03	17.62	17.09	17.23	18.72	19.25	19.41	21.62	22.62	23.79	24.40	24.82	23.54	22.61	21.41	18.79	18.03
15	17.74	17.33	16.92	17.17	18.66	19.01	19.29	21.07	21.95	23.29	23.96	24.37	23.17	22.11	20.80	18.19	17.74
17.5	17.56	17.03	16.63	16.94	18.24	18.83	18.93	20.77	21.64	22.73	23.65	24.06	22.61	21.74	20.38	17.96	17.56
20	17.32	16.74	16.28	16.70	17.95	18.30	18.57	20.10	21.27	22.05	22.71	23.55	22.11	21.07	19.89	17.72	17.32
22.5	16.86	16.33	16.10	16.06	17.77	17.70	17.85	19.85	20.53	21.67	22.21	22.61	21.49	20.33	19.77	17.31	16.86
25	16.33	16.04	15.87	15.77	17.06	17.34	17.68	19.00	19.98	20.80	21.58	21.79	20.75	20.08	19.16	17.07	16.33
27.5	15.86	15.68	15.05	15.47	16.64	16.93	17.08	18.33	19.00	20.05	20.70	20.97	20.13	19.28	18.86	16.18	15.86
30	15.80	15.39	14.64	15.00	16.04	16.33	16.66	18.09	18.63	18.87	19.70	20.21	19.32	18.91	18.07	15.95	15.80
32.5	15.33	15.04	15.05	14.71	15.69	15.74	15.76	17.23	17.77	18.37	19.01	19.26	18.64	18.30	17.28	15.35	15.33
35	15.15	14.57	14.40	14.13	15.33	14.90	15.59	16.69	17.10	17.69	18.25	18.63	18.27	17.62	17.22	15.24	15.15
37.5	14.80	14.45	14.29	14.07	15.15	14.90	15.11	16.02	16.36	16.82	17.37	18.00	17.34	17.31	16.73	14.88	14.80
40	14.62	14.10	14.11	13.89	14.74	14.31	14.57	15.47	15.75	16.19	16.31	17.31	16.28	16.82	16.12	14.70	14.62
42.5	14.15	13.69	13.64	13.31	14.32	14.43	13.91	14.86	15.20	15.39	15.81	16.55	15.73	15.59	15.27	13.99	14.15
45	13.74	13.57	13.35	12.84	13.73	13.41	13.26	14.13	14.52	14.64	14.87	15.48	15.17	15.22	14.73	13.82	13.74
47.5	13.57	13.04	12.82	12.72	13.61	12.82	12.72	13.52	13.79	13.77	13.99	14.47	14.42	14.60	14.54	13.17	13.57
50	13.16	12.87	12.71	12.43	12.83	12.52	12.18	13.16	12.93	13.15	12.92	13.71	13.62	13.87	13.75	12.81	13.16
52.5	12.51	12.46	12.18	11.84	12.30	11.75	11.71	12.24	12.07	12.21	12.17	12.83	12.75	12.94	13.21	12.22	12.51
55	12.16	12.10	11.83	11.37	12.00	11.33	10.87	11.45	11.39	11.22	11.29	12.01	11.76	12.39	12.48	11.63	12.16
57.5	11.57	10.99	11.01	10.91	10.81	10.20	10.33	10.54	10.47	10.10	10.04	10.74	10.64	11.34	11.57	11.27	11.57
60	10.75	10.64	10.31	10.14	9.92	9.72	9.50	9.81	9.37	9.16	9.16	9.48	9.52	10.11	10.84	10.21	10.75
62.5	10.16	9.93	9.90	9.21	9.21	8.77	8.78	8.77	8.45	8.17	8.28	8.22	8.78	9.25	9.80	9.62	10.16
65	9.22	9.29	8.96	8.50	8.38	8.12	7.82	8.04	7.41	6.92	6.90	7.34	7.23	8.02	8.89	8.55	9.22
67.5	8.16	8.00	7.97	7.39	7.54	7.28	6.69	6.77	6.24	5.80	5.52	5.95	6.36	6.79	7.56	7.78	8.16
70	7.28	7.24	7.03	6.57	6.53	5.97	5.62	5.30	5.14	4.43	4.51	4.37	4.94	5.49	6.46	6.84	7.28
72.5	6.11	6.06	6.03	5.40	5.23	5.20	4.66	4.39	3.85	3.31	3.32	3.11	3.63	4.39	5.49	5.65	6.11
75	4.93	4.95	4.81	4.46	4.15	3.65	3.47	2.99	2.68	1.76	1.63	1.78	2.14	3.09	4.03	4.65	4.93
77.5	3.82	3.60	3.58	3.06	2.97	2.40	2.03	1.83	1.03	0.64	0.25	0.21	0.66	1.37	2.51	3.46	3.82
80	2.35	2.54	2.29	2.06	1.48	1.15	0.78	0.25	0.32	0.92	1.45	1.56	0.71	0.20	1.42	2.34	2.35
82.5	1.06	0.61	1.18	0.72	0.07	0.34	0.83	0.97	1.92	2.66	2.95	3.14	2.57	1.77	0.47	0.74	1.06
85	0.70	0.51	0.69	0.57	1.49	1.83	1.79	2.49	3.45	3.91	4.52	4.91	4.00	3.25	1.98	0.56	0.70
87.5	2.05	2.09	1.92	1.98	3.10	3.14	3.58	4.25	5.29	5.53	6.15	6.61	5.79	5.15	4.17	2.21	2.05
90	3.70	3.62	3.50	3.73	4.52	4.80	4.95	6.14	6.33	7.21	7.84	8.06	7.59	6.63	5.75	4.05	3.70
92.5	5.64	5.32	5.08	5.43	6.31	6.47	6.68	7.72	8.36	9.07	9.91	9.83	9.27	8.23	7.27	5.47	5.64
95	7.22	7.08	6.55	7.07	7.79	8.32	8.41	9.43	10.38	10.82	11.42	12.10	10.94	10.08	9.22	7.72	7.22
97.5	9.04	8.78	8.71	8.65	9.58	9.80	10.09	11.43	12.28	12.56	13.30	13.68	12.80	12.35	11.16	9.14	9.04
100	11.39	10.77	10.35	10.64	11.54	11.71	12.12	13.63	13.88	14.80	15.25	15.89	14.60	13.89	13.35	11.15	11.39
102.5	13.15	12.83	12.57	12.34	13.50	13.79	13.91	15.39	15.90	16.54	16.94	17.53	16.90	16.29	15.29	13.34	13.15

TABLE 1-1-continued

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
105	15.62	15.00	14.56	14.45	15.88	15.82	15.76	17.52	17.86	18.53	19.39	19.80	18.88	18.39	17.72	15.64	15.62
107.5	17.67	16.99	16.85	16.79	17.84	17.78	17.91	19.53	19.89	20.59	21.14	21.69	20.80	20.54	20.15	17.71	17.67
110	19.55	19.57	18.89	18.61	19.98	19.81	20.00	21.72	21.91	22.70	23.34	23.65	22.79	22.82	22.34	19.96	19.55
112.5	22.31	21.69	21.59	21.07	22.42	22.01	21.85	24.03	24.06	24.94	25.16	26.04	25.33	25.03	24.89	22.56	22.31
115	24.43	24.03	23.69	23.17	24.44	24.21	24.30	26.10	26.33	27.25	27.10	28.32	27.13	27.43	27.08	24.81	24.43
117.5	27.01	26.32	25.97	25.22	26.94	26.59	26.56	28.48	28.72	29.42	29.61	30.84	29.67	29.34	29.82	27.30	27.01
120	29.83	28.78	28.43	27.74	29.02	28.86	28.77	30.67	31.05	31.35	31.81	32.86	31.78	32.05	31.94	29.66	29.83
122.5	32.35	31.48	30.95	30.44	31.63	31.30	31.28	33.10	33.32	33.91	34.07	35.19	34.32	34.82	34.62	32.15	32.35
125	35.00	33.89	33.82	32.95	34.31	33.86	33.55	35.30	35.71	36.02	36.14	37.53	36.62	36.97	37.05	34.69	35.00
127.5	37.23	36.64	35.86	35.41	37.10	36.18	35.88	37.61	38.29	38.39	39.21	39.93	38.97	39.31	39.66	37.35	37.23
130	39.81	39.05	38.91	38.11	39.42	38.80	38.33	40.10	40.32	41.12	41.16	42.20	41.27	41.96	42.21	39.78	39.81
132.5	42.45	41.98	41.01	40.33	41.98	41.18	40.95	42.78	42.59	42.93	43.92	44.66	43.75	44.54	45.07	42.44	42.45
135	45.10	44.56	43.71	43.20	44.65	43.86	42.98	45.34	45.35	45.61	46.17	47.12	46.29	46.88	47.01	45.64	45.10

TABLE 1-2

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	3.20	3.20	3.45	3.26	3.20	3.26	3.38	3.26	3.51	3.20	3.38	3.26	3.01	3.26	3.38	3.26	3.20
2.5	3.82	2.07	1.18	2.30	4.03	4.66	5.26	5.71	5.07	3.18	3.21	4.84	6.99	8.61	8.31	5.89	3.82
5	3.82	2.49	1.61	2.30	3.91	5.10	5.39	5.59	5.13	3.06	3.15	5.28	7.24	8.48	8.18	6.27	3.82
7.5	3.76	2.62	1.79	2.60	3.91	4.97	5.33	5.71	5.01	3.49	3.27	5.09	7.31	8.61	8.25	6.08	3.76
10	3.88	3.23	2.03	3.16	4.22	5.29	5.39	6.09	5.20	3.37	3.64	4.97	7.18	8.81	8.70	6.15	3.88
12.5	4.38	3.48	2.64	3.46	4.84	5.29	5.64	5.71	5.13	3.24	3.64	5.09	7.31	8.68	8.90	6.59	4.38
15	4.75	4.15	3.25	4.26	5.28	5.54	5.77	6.22	5.45	3.49	3.52	5.09	7.24	9.14	8.77	6.78	4.75
17.5	4.87	4.46	3.73	4.44	5.59	6.35	6.21	6.60	6.01	3.99	3.83	5.41	7.82	9.20	9.29	7.04	4.87
20	5.18	4.82	4.40	5.30	6.09	6.23	6.65	6.73	6.01	4.17	4.01	5.91	7.89	9.14	9.35	7.55	5.18
22.5	5.80	5.38	4.77	5.49	6.40	6.73	6.91	7.04	6.64	4.30	4.57	6.10	8.21	9.53	9.48	7.74	5.80
25	5.99	6.11	5.56	6.10	6.96	6.98	6.97	7.55	6.89	4.67	4.95	6.36	8.40	9.79	9.87	7.99	5.99
27.5	6.67	6.60	6.17	6.71	7.40	7.49	7.09	7.99	7.33	5.10	5.19	6.74	8.73	9.85	10.33	8.05	6.67
30	7.29	7.52	6.96	7.39	7.71	8.12	7.54	8.06	7.78	5.60	5.63	7.05	8.86	10.25	10.33	8.82	7.29
32.5	7.97	8.13	7.56	8.00	8.58	8.74	8.04	8.75	8.34	5.97	6.37	7.43	9.31	10.77	10.72	9.20	7.97
35	8.47	8.69	8.60	9.04	9.20	9.18	8.61	8.94	8.72	6.90	6.69	7.87	9.82	10.83	11.24	9.71	8.47
37.5	9.15	9.61	9.08	9.47	9.64	9.63	9.05	9.58	9.41	7.52	7.55	8.25	10.27	11.29	11.57	10.09	9.15
40	9.77	10.34	9.63	10.15	10.26	10.07	9.37	9.96	9.47	7.77	7.74	8.95	9.95	11.62	11.76	10.47	9.77
42.5	10.27	10.77	10.18	10.58	10.57	10.25	9.75	10.15	10.23	8.45	8.18	9.14	10.73	11.81	12.02	10.98	10.27
45	10.70	11.26	10.91	10.88	11.26	10.63	10.19	10.65	10.48	8.82	8.98	9.77	10.92	11.88	12.15	11.30	10.70
47.5	11.14	11.81	11.57	11.44	11.38	10.76	10.38	11.03	10.92	9.32	9.36	10.02	10.86	11.94	12.22	11.42	11.14
50	11.26	12.43	12.00	11.56	11.57	11.01	10.63	11.03	10.80	9.63	9.73	10.34	11.11	12.01	12.54	11.87	11.26
52.5	11.57	12.43	12.00	12.05	11.82	11.13	11.07	11.10	11.30	10.00	10.10	10.59	11.31	11.94	12.28	11.62	11.57
55	12.00	12.79	12.36	12.11	11.75	11.13	10.69	11.35	11.49	10.00	10.22	10.71	11.31	11.75	12.41	11.55	12.00
57.5	12.19	12.67	12.42	12.29	11.75	11.51	11.07	11.03	11.05	10.50	10.22	10.78	11.05	11.55	11.83	11.68	12.19
60	12.19	12.43	12.49	12.23	11.75	10.95	10.75	10.97	11.05	10.43	10.72	10.65	11.11	11.16	11.76	11.55	12.19
62.5	11.88	12.43	12.49	12.11	11.57	10.76	10.57	10.84	10.98	10.43	10.41	10.53	10.73	10.70	11.44	11.42	11.88
65	11.69	11.93	12.24	11.87	11.32	10.82	10.38	10.34	10.67	10.56	10.47	10.21	10.47	10.18	10.91	10.98	11.69
67.5	11.32	11.57	11.63	11.31	10.76	9.88	9.87	10.02	10.17	10.00	10.10	9.83	9.44	9.72	10.26	10.60	11.32
70	10.89	11.20	11.57	10.76	10.51	9.88	9.43	9.64	9.66	9.69	9.79	9.58	9.18	9.07	9.55	9.90	10.89
72.5	10.14	10.52	10.91	9.96	9.76	9.18	8.80	8.82	9.10	9.26	9.29	9.07	8.53	8.35	8.77	9.14	10.14
75	9.52	9.79	9.99	9.54	8.70	8.43	8.10	7.99	8.34	8.64	8.61	8.38	7.70	7.57	7.92	8.24	9.52
77.5	8.59	8.87	9.26	8.68	8.08	7.49	7.16	7.04	7.59	7.95	7.87	7.62	6.79	6.52	6.88	7.48	8.59
80	7.85	7.89	8.23	7.51	6.84	6.61	6.21	5.84	6.58	7.15	6.87	6.48	5.83	5.48	5.71	6.27	7.85
82.5	6.67	6.54	7.02	6.59	6.09	5.41	5.39	5.08	5.57	6.53	6.06	5.47	4.73	4.37	4.60	5.26	6.67
85	5.31	5.50	6.10	5.61	4.59	4.53	4.25	3.75	4.31	5.10	5.44	4.59	3.44	2.87	2.91	4.30	5.31
87.5	4.07	4.46	4.65	4.38	3.54	3.21	2.99	2.42	3.31	4.23	4.14	3.26	2.34	1.76	1.03	2.71	4.07
90	2.64	3.05	3.19	2.85	2.04	1.51	1.54	1.22	1.67	2.87	2.96	1.68	0.79	0.06	0.21	1.50	2.64
92.5	1.15	1.27	2.15	1.19	0.73	0.38	0.04	0.11	0.29	1.75	1.78	1.05	0.69	1.57	1.71	0.09	1.15
95	0.65	0.33	0.27	0.28	1.13	1.32	1.36	1.57	1.28	0.08	0.29	0.78	2.04	3.33	3.01	1.68	0.65
97.5	2.14	1.98	1.55	1.87	2.75	2.95	2.69	3.15	2.61	1.16	1.33	2.23	3.59	4.77	5.02	3.27	2.14
100	4.06	3.82	3.25	3.83	4.18	4.78	4.45	4.60	4.56	2.46	3.13	3.68	5.59	6.59	6.65	4.98	4.06
102.5	5.86	5.66	4.96	5.86	6.24	6.41	6.10	6.57	6.07	4.32	4.55	5.64	7.59	8.62	8.47	7.21	5.86
105	7.72	7.68	7.14	7.45	7.92	7.92	7.80	8.47	7.83	6.06	6.48	7.22	9.07	10.58	10.68	8.80	7.72
107.5	9.89	9.77	9.09	9.48	10.22	10.06	10.07	10.17	9.90	8.04	8.28	9.37	11.33	12.14	12.57	11.03	9.89
110	11.81	11.91	11.21	11.56	11.97	12.14	11.40	11.95	11.85	9.97	9.96	11.20	13.20	14.30	14.91	13.06	11.81
112.5	14.17	14.36	13.52	13.71	14.46	14.02	13.79	14.23	13.87	11.83	12.01	13.41	15.07	16.84	16.86	15.03	14.17
115	16.28	16.45	15.95	16.04	16.57	16.16	15.75	16.44	16.20	13.93	13.43	15.50	17.39	18.80	19.33	17.64	16.28
117.5	18.69	18.84	18.26	18.55	18.81	18.61	18.21	18.53	18.33	16.04	15.98	17.77	19.39	20.95	21.35	19.74	18.69
120	21.05	21.23	20.94	20.70	21.12	20.63	20.29	21.06	20.79	18.21	17.97	19.92	21.78	23.63	23.95	22.28	21.05
122.5	23.47	23.56	23.07	23.52	23.42	23.02	22.76	23.09	22.68	20.32	20.02	22.06	24.36	25.59	26.30	24.38	23.47
125	26.01	26.32	25.80	25.85	25.91	25.60	25.09	25.62	25.00	22.86	23.00	24.53	26.29	28.46	28.77	27.12	26.01
127.5	28.68	28.89	28.35	28.55	28.46	28.05	27.17	28.15	28.15	24.97	25.30	26.93	28.93	30.68	31.43	29.34	28.68
130	31.41	31.34	30.90	30.64	31.08	30.63	29.76	30.37	30.60	27.51	27.66	29.01	31.38	33.36	33.84	32.01	31.41

TABLE 1-2-continued

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
132.5	33.64	34.22	33.82	33.52	33.57	32.64	32.16	32.84	33.12	29.99	30.33	31.60	33.71	35.58	36.57	34.37	33.64
135	36.31	36.92	36.13	36.40	36.18	35.60	34.75	35.05	35.32	32.66	32.69	34.51	36.61	38.19	39.05	38.06	36.31

TABLE 1-3

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	0.60	0.66	0.53	0.27	0.93	0.86	0.79	0.86	1.32	0.66	0.53	0.27	0.93	0.86	0.79	0.86	0.60
2.5	1.06	0.70	1.51	3.20	2.85	2.45	0.51	0.36	0.15	2.22	4.06	5.38	5.70	4.26	1.79	0.19	1.06
5	0.99	0.89	0.99	2.94	3.10	2.71	0.57	0.43	0.05	1.83	3.87	5.13	5.82	3.88	1.73	0.59	0.99
7.5	1.19	0.83	1.06	2.62	2.60	2.64	0.05	0.82	0.21	1.83	3.55	4.57	5.51	3.32	1.73	0.46	1.19
10	1.12	0.83	0.73	2.88	2.41	2.20	0.14	0.82	0.47	1.45	3.05	4.13	5.14	2.87	1.28	0.72	1.12
12.5	1.19	1.42	0.54	2.18	2.21	2.20	0.66	1.21	1.06	1.25	2.61	3.33	4.65	2.12	0.96	1.44	1.19
15	1.72	1.75	0.18	1.99	2.02	1.30	0.99	1.54	1.64	0.74	2.42	2.77	3.85	1.55	0.51	1.05	1.72
17.5	1.92	2.35	0.57	1.29	0.88	0.92	1.83	2.07	2.17	0.04	1.54	2.58	3.60	1.30	0.20	1.90	1.92
20	2.58	2.35	1.02	0.65	0.31	0.09	2.09	2.59	2.69	0.73	0.79	1.34	2.55	0.48	0.58	2.69	2.58
22.5	3.23	3.34	1.67	0.18	0.90	0.10	3.20	3.64	3.53	1.31	0.10	0.66	1.44	0.52	1.35	2.89	3.23
25	3.96	3.74	2.91	0.69	1.41	1.25	3.40	3.97	3.92	2.21	0.53	0.33	0.45	1.78	2.19	3.80	3.96
27.5	4.69	4.80	3.16	1.58	2.36	2.08	4.44	4.42	5.03	2.97	1.73	1.64	0.53	2.66	2.70	4.20	4.69
30	5.21	5.66	4.33	2.60	3.12	2.72	5.35	5.67	5.42	4.13	2.80	2.44	1.40	3.36	3.47	4.92	5.21
32.5	5.74	6.39	4.66	3.88	4.39	3.74	6.19	6.32	6.86	4.64	4.05	3.75	2.57	4.49	4.30	5.91	5.74
35	6.40	7.18	5.57	4.32	5.03	4.88	7.04	7.18	7.44	5.79	4.62	4.74	3.43	5.75	5.33	6.82	6.40
37.5	7.19	7.91	6.61	5.41	6.36	5.52	7.89	7.96	8.49	6.82	5.88	6.10	4.85	6.19	6.04	7.94	7.19
40	8.31	8.63	7.71	6.68	7.57	6.54	8.86	8.95	9.40	7.65	7.26	7.10	5.97	7.26	7.00	8.33	8.31
42.5	9.17	9.36	8.68	7.38	8.14	7.56	9.64	9.60	9.66	8.55	7.64	8.09	6.83	9.02	8.34	9.32	9.17
45	9.70	9.96	9.59	8.78	9.29	8.46	10.23	10.06	10.51	9.38	9.15	8.90	8.00	9.90	8.60	9.65	9.70
47.5	9.77	10.49	10.50	8.97	9.92	9.61	10.81	10.65	10.96	10.22	9.84	10.26	8.99	10.53	9.50	10.50	9.77
50	10.75	11.21	11.15	10.18	10.68	10.12	11.33	11.76	11.29	10.60	10.72	10.94	9.91	11.29	10.53	10.90	10.75
52.5	11.35	11.55	11.54	10.89	11.64	11.01	11.98	12.02	12.07	11.24	11.16	11.81	10.53	12.11	10.78	11.49	11.35
55	11.41	12.21	12.06	11.71	12.15	11.26	12.18	12.29	12.33	11.95	12.04	12.12	11.33	12.67	11.42	11.62	11.41
57.5	12.01	11.94	12.38	12.16	12.21	11.58	12.64	12.22	12.72	12.07	12.16	12.99	11.95	12.67	11.42	12.21	12.01
60	12.01	12.27	12.38	12.54	12.91	12.09	12.90	12.35	12.59	12.65	12.48	13.18	12.51	13.24	12.32	12.08	12.01
62.5	12.01	11.94	12.58	12.42	13.23	12.48	12.83	12.09	12.79	12.39	13.11	13.30	12.94	13.37	12.51	12.41	12.01
65	11.81	12.21	12.97	12.86	13.23	12.35	12.70	12.35	12.26	12.65	12.73	13.24	13.00	13.49	12.45	12.21	11.81
67.5	12.01	12.34	12.38	12.54	13.29	12.60	12.24	12.29	12.20	12.33	12.73	13.30	13.19	13.05	12.39	11.95	12.01
70	11.35	11.74	11.99	12.54	12.91	12.35	12.18	11.76	11.87	12.33	12.67	12.93	13.00	12.99	11.94	11.55	11.35
72.5	11.08	11.41	11.99	12.54	12.15	11.84	11.33	11.24	11.22	11.69	12.04	12.93	12.88	12.48	11.68	11.09	11.08
75	10.36	11.02	11.15	11.78	12.02	11.33	10.88	10.71	10.57	11.24	11.72	12.31	12.57	12.48	11.17	10.90	10.36
77.5	9.50	10.02	10.50	11.40	11.13	11.01	9.64	9.67	9.92	10.66	11.35	11.63	11.83	11.29	10.65	9.98	9.50
80	8.91	9.03	9.59	10.57	10.24	10.18	8.80	8.75	8.75	9.89	10.34	10.94	11.40	10.66	9.82	9.45	8.91
82.5	7.79	7.58	8.62	9.93	9.60	9.10	8.15	7.64	7.83	9.00	9.77	10.20	10.59	9.78	8.79	8.07	7.79
85	7.13	6.78	7.77	8.34	8.71	8.46	7.10	6.52	6.34	7.65	8.77	9.08	9.61	8.90	8.09	7.02	7.13
87.5	5.41	5.52	6.15	7.32	7.19	7.12	5.41	5.28	5.36	6.69	7.39	7.72	8.56	7.39	6.74	5.64	5.41
90	4.42	4.07	5.05	6.42	5.98	5.78	4.63	3.84	3.73	5.22	6.38	6.97	7.26	6.00	5.52	4.33	4.42
92.5	2.38	2.42	3.88	4.77	4.46	4.82	2.87	2.53	2.56	3.94	4.62	5.11	6.03	4.43	4.05	2.82	2.38
95	1.06	1.03	2.26	3.68	2.80	3.10	1.31	0.76	1.19	2.53	3.68	3.68	4.61	2.79	2.51	1.24	1.06
97.5	0.33	0.63	0.44	1.84	1.47	1.38	0.51	0.82	0.83	0.54	2.17	2.13	3.00	1.53	0.97	0.07	0.33
100	1.91	2.55	0.73	0.01	0.44	0.04	2.20	2.65	2.40	0.93	0.22	0.52	1.58	0.08	0.70	1.91	1.91
102.5	3.63	4.07	2.74	1.73	1.90	1.81	4.09	4.09	4.09	2.98	1.98	1.40	0.45	2.62	2.43	4.07	3.63
105	5.87	6.38	5.15	3.52	4.18	3.54	6.17	6.19	6.11	4.33	3.55	3.70	1.93	4.01	4.10	5.91	5.87
107.5	7.91	8.10	6.70	5.87	5.90	5.58	8.12	8.09	8.00	6.77	5.69	5.44	3.97	6.40	6.15	8.08	7.91
110	9.96	10.22	9.11	7.60	8.12	7.94	9.75	10.32	10.15	8.94	7.51	7.49	6.50	8.73	8.59	9.92	9.96
112.5	12.46	12.21	11.64	9.95	10.35	10.17	12.42	12.67	12.36	10.80	9.65	9.59	8.29	10.68	10.58	12.15	12.46
115	13.98	14.98	13.78	12.12	13.08	12.28	14.69	14.51	14.84	13.05	12.04	11.89	10.76	13.39	13.02	14.58	13.98
117.5	16.55	17.37	15.92	14.35	15.24	14.06	16.78	17.00	17.12	15.10	14.37	14.06	13.23	15.09	15.26	16.35	16.55
120	19.33	19.42	18.65	16.45	17.65	16.93	19.51	19.03	19.86	17.79	17.07	16.98	15.57	17.98	17.38	19.31	19.33
122.5	21.50	22.00	20.86	19.19	20.26	19.55	21.66	21.65	22.33	20.22	19.46	18.72	17.92	20.37	19.62	21.67	21.50
125	23.81	24.38	23.45	21.87	22.42	21.72	24.13	24.40	24.81	22.66	22.04	21.76	20.14	23.14	22.89	23.90	23.81
127.5	26.25	26.89	25.86	24.23	25.28	24.59	26.73	26.63	27.22	24.90	24.36	24.36	23.16	25.66	24.88	26.79	26.25
130	29.09	29.67	28.52	27.10	28.01	26.50	29.14	29.71	29.96	27.72	26.63	27.15	25.45	28.37	27.32	29.29	29.09
132.5	31.53	32.12	31.12	29.52	30.74	29.18	31.61	31.67	32.24	30.54	29.21	29.88	28.23	30.70	29.82	31.58	31.53
135	34.37	34.83	33.91	32.51	33.73	31.61	34.67	35.08	34.91	33.36	31.97	32.37	30.94	33.47	32.65	35.06	34.37

TABLE 1-4

γ	c: 0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	4.00	3.71	3.62	3.23	3.04	3.23	2.65	3.42	3.13	3.71	3.62	3.23	3.04	3.23	2.65	3.42	4.00
2.5	3.71	2.51	2.70	2.56	2.69	3.58	3.04	3.19	2.45	2.03	1.09	0.48	0.08	0.45	1.84	2.33	3.71
5	3.04	2.90	3.18	2.17	2.69	3.29	2.56	2.80	2.06	2.42	0.79	0.12	0.02	0.95	1.35	2.23	3.04
7.5	3.52	3.00	2.89	1.69	2.30	2.72	2.37	2.51	2.25	2.32	0.89	0.02	0.22	0.25	1.94	2.43	3.52
10	3.04	2.61	2.60	2.56	1.82	2.81	2.37	2.03	2.15	1.93	0.59	0.62	0.52	0.45	1.94	2.62	3.04
12.5	3.04	2.90	2.21	1.40	1.53	2.91	1.99	2.13	1.57	1.74	0.99	0.62	0.62	0.65	2.14	2.23	3.04
15	3.13	2.41	1.44	1.59	1.04	2.04	1.79	1.26	1.77	1.83	0.79	0.22	0.32	1.25	1.84	2.33	3.13
17.5	2.75	2.22	1.83	1.11	1.24	1.76	1.02	1.06	0.89	1.25	0.40	0.12	0.22	0.65	2.14	2.14	2.75
20	3.04	2.03	1.92	0.14	0.46	0.89	0.44	0.68	0.70	1.15	0.20	0.32	0.92	0.65	1.55	2.04	3.04
22.5	2.07	1.44	1.25	0.04	0.12	0.60	0.13	0.38	0.22	0.56	0.20	0.22	0.32	0.55	1.45	1.75	2.07
25	2.07	0.57	0.96	0.83	1.28	0.74	1.58	0.67	0.95	0.56	0.70	0.22	0.02	0.05	1.84	1.45	2.07
27.5	0.72	0.47	0.11	1.12	1.95	1.60	1.96	1.54	1.43	0.31	0.89	0.58	0.28	0.45	1.25	1.26	0.72
30	1.01	0.69	1.37	1.71	3.30	2.28	3.31	2.70	2.40	0.80	1.79	0.68	0.68	0.45	1.05	1.06	1.01
32.5	0.14	1.47	1.37	2.87	3.21	3.53	4.37	3.76	3.66	1.78	2.58	1.48	1.78	1.54	0.17	0.21	0.14
35	1.12	2.05	3.02	4.42	4.75	4.29	5.43	4.92	4.44	2.66	3.28	2.18	1.58	1.94	0.72	0.89	1.12
37.5	1.21	3.02	3.31	5.00	5.82	5.16	6.58	6.18	5.60	4.12	4.37	2.48	2.48	2.64	1.11	1.87	1.21
40	3.14	3.79	4.47	6.07	6.59	6.60	7.07	7.04	6.09	4.61	5.16	3.37	3.48	3.24	2.29	2.75	3.14
42.5	3.53	5.54	5.34	6.94	7.85	7.27	8.89	7.62	7.35	5.78	5.95	3.97	4.58	4.43	2.98	3.43	3.53
45	5.07	6.02	6.60	7.52	8.43	8.90	9.28	8.78	7.83	6.96	6.85	5.47	5.48	5.43	4.06	4.41	5.07
47.5	5.65	7.09	7.09	8.59	9.30	8.71	9.95	9.36	8.90	7.44	7.54	6.07	5.87	6.13	4.85	5.77	5.65
50	6.52	7.48	8.06	9.08	10.07	9.67	10.63	10.13	9.87	8.23	8.04	6.57	7.17	6.72	5.83	6.56	6.52
52.5	7.97	8.74	8.64	10.14	10.84	10.73	11.40	11.00	10.45	9.50	9.03	7.07	7.57	7.62	6.42	7.14	7.97
55	8.17	9.13	9.61	10.82	10.94	10.92	11.78	11.58	10.84	9.89	9.23	7.96	8.07	8.12	6.91	7.92	8.17
57.5	9.52	9.42	10.19	11.31	11.52	12.26	12.65	11.48	11.32	10.18	9.62	8.46	8.47	8.92	7.90	8.51	9.52
60	8.94	9.81	10.38	11.21	11.52	11.40	12.36	12.16	11.42	10.77	9.72	9.56	8.37	9.02	8.09	9.00	8.94
62.5	10.48	10.10	10.97	11.31	11.33	12.07	12.36	12.06	12.00	10.47	10.72	9.26	9.17	8.82	8.88	9.78	10.48
65	10.00	10.68	10.67	11.79	11.42	11.88	11.98	12.26	11.42	10.86	10.42	9.86	9.47	9.91	9.96	9.49	10.00
67.5	10.48	11.07	10.67	11.40	11.81	11.78	12.36	11.87	11.71	11.35	9.82	10.36	9.17	9.81	9.37	10.46	10.48
70	10.19	11.07	10.48	11.31	11.13	11.59	11.69	11.58	11.32	10.38	10.32	9.56	9.37	9.81	9.77	10.07	10.19
72.5	10.00	10.58	10.09	10.82	11.04	11.30	11.88	11.19	10.74	10.86	9.72	9.46	9.07	9.31	8.88	10.07	10.00
75	10.39	10.10	10.29	10.43	9.88	10.73	10.24	10.52	10.16	9.69	9.53	8.66	8.47	9.41	9.27	9.68	10.39
77.5	9.52	9.81	9.41	9.85	9.49	9.67	9.66	9.94	9.58	9.30	9.13	8.06	8.67	8.92	9.27	8.70	9.52
80	9.23	9.13	8.83	8.78	8.43	9.19	9.28	9.17	9.00	8.81	8.43	7.96	7.67	8.22	8.88	9.10	9.23
82.5	8.55	8.74	8.54	7.62	8.14	9.10	8.22	8.11	8.61	8.52	7.34	7.67	7.77	7.62	8.29	8.41	8.55
85	8.17	7.77	7.48	7.14	6.88	7.46	7.07	6.95	7.35	7.44	7.05	6.47	6.37	7.42	8.09	7.53	8.17
87.5	7.59	6.99	6.60	5.68	5.72	6.21	6.01	5.79	5.99	6.08	6.05	5.47	6.07	6.23	7.01	7.53	7.59
90	6.33	5.83	5.83	4.62	4.66	4.87	4.27	5.40	4.92	5.49	4.66	5.07	4.98	5.43	6.52	6.07	6.33
92.5	5.36	4.86	4.57	3.55	3.30	3.91	3.50	3.47	3.18	4.61	3.47	4.07	4.28	3.73	6.23	4.70	5.36
95	4.69	3.70	2.92	2.39	2.44	2.76	2.15	2.31	2.40	3.54	2.09	3.17	2.68	3.14	3.67	4.02	4.69
97.5	3.43	2.14	1.95	1.32	0.70	1.41	0.33	0.48	1.14	1.58	1.39	1.48	1.48	1.54	3.18	3.14	3.43
100	2.08	0.98	0.60	0.04	1.14	0.32	1.41	0.10	0.60	0.71	0.40	0.58	0.78	0.64	1.50	1.48	2.08
102.5	0.83	0.28	0.86	2.56	2.69	1.85	2.66	2.51	1.96	1.15	1.68	0.52	1.52	1.15	0.23	0.11	0.83
105	1.11	1.74	2.02	3.53	3.85	3.87	4.39	4.15	3.32	2.91	3.27	2.31	2.02	1.95	0.66	1.06	1.11
107.5	2.94	3.87	3.77	5.47	5.59	5.79	6.03	5.89	6.03	3.89	4.76	4.41	3.72	4.14	2.53	2.72	2.94
110	3.91	5.13	5.51	6.73	7.62	7.23	8.05	7.72	7.39	6.03	6.05	5.31	5.22	5.33	4.10	4.48	3.91
112.5	5.84	7.07	7.45	8.96	9.16	8.67	10.27	9.65	9.52	7.99	8.23	6.90	6.82	6.73	5.87	6.24	5.84
115	7.29	8.72	9.39	10.70	11.00	11.55	12.58	11.97	10.88	9.84	10.22	8.80	9.02	9.02	6.95	7.31	7.29
117.5	9.03	10.85	11.23	12.84	13.41	12.99	13.73	13.52	12.72	11.70	11.70	10.79	10.92	11.41	9.12	9.36	9.03
120	11.83	12.31	13.17	14.78	15.06	14.63	15.95	15.54	14.66	13.75	14.09	12.39	12.92	12.61	10.89	11.12	11.83
122.5	13.37	14.73	15.49	17.01	17.86	17.51	18.93	17.96	17.38	15.80	15.87	14.29	14.22	14.40	12.86	13.27	13.37
125	15.11	16.77	16.85	19.04	19.11	19.43	20.76	19.98	19.51	17.66	18.15	17.28	16.02	16.30	15.12	15.03	15.11
127.5	17.23	19.10	19.08	21.08	21.43	21.35	22.88	22.30	21.84	19.51	20.24	19.28	18.72	18.09	16.50	17.27	17.23
130	19.26	21.33	21.21	23.41	24.33	23.94	25.19	24.13	24.26	22.64	23.01	20.67	19.62	20.88	18.86	19.13	19.26
132.5	21.77	23.37	23.15	25.44	26.27	25.67	27.02	27.03	26.40	24.50	24.50	23.27	22.82	23.17	21.61	21.18	21.77
135	24.19	26.18	26.06	27.96	28.59	28.84	30.00	28.86	28.82	26.94	26.98	24.86	25.02	25.36	23.77	24.40	24.19

TABLE 1-5

γ	c: 0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	29.93	29.85	29.85	29.61	29.61	29.29	29.61	29.61	29.21	29.85	29.85	29.61	29.61	29.29	29.61	29.61	29.93
2.5	30.26	28.53	27.92	27.42	27.56	29.83	31.53	33.88	35.57	37.32	37.75	36.69	35.88	34.21	32.70	31.38	30.26
5	30.34	29.36	27.92	27.59	28.31	29.50	31.45	33.05	35.14	36.75	36.40	35.97	34.50	33.83	32.01	30.67	30.34
7.5	29.85	28.95	28.25	28.17	28.39	29.26	31.29	32.60	33.97	35.75	35.26	34.97	33.77	33.08	31.47	30.59	29.85
10	29.53	28.20	28.00	27.75	28.06	28.45	30.43	31.24	32.37	34.53	34.20	33.32	32.23	31.96	30.55	30.20	29.53
12.5	28.97	27.54	27.33	27.42	27.48	27.72	29.02	30.71	31.13	33.03	32.49	31.74	30.48	30.61	29.86	29.17	28.97
15	27.92	26.88	26.66	26.74	26.81	26.67	27.93	28.91	29.24	31.31	30.86	29.37	28.51	29.04	28.40	27.99	27.92
17.5	26.95	26.31	25.82	25.90	25.90	25.46	26.44	27.10	27.35	29.52	28.66	27.58	26.62	27.10	26.71	26.57	26.95
20	25.74	24.66	24.65	24.72	24.65	23.68	24.72	25.37	25.16	27.30	26.88	25.43	24.65	25.60	24.94	24.83	25.74
22.5	24.61	22.84	23.39	23.37	23.32	22.87	22.84	23.18	23.56	25.09	24.75	23.28	22.53	23.58	22.95	23.18	24.61
25	22.67	21.19	21.55	21.94	21.82	20.60	21.20	21.23	21.23	23.08	22.76	20.98	20.34	21.41	20.72	21.36	22.67

TABLE 1-5-continued

	c																
γ	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
27.5	20.65	19.13	19.95	20.26	20.15	19.06	18.85	18.89	18.76	20.65	19.77	18.40	17.94	19.46	18.88	19.23	20.65
30	18.55	17.31	17.86	18.07	18.24	16.64	16.58	16.63	16.21	18.22	17.50	16.47	15.53	16.77	16.49	17.34	18.55
32.5	16.37	14.84	15.43	16.05	16.07	13.40	14.54	13.84	13.08	15.71	14.80	13.88	12.90	14.45	14.11	14.66	16.37
35	13.87	12.11	12.66	13.35	13.32	11.29	11.41	11.06	10.60	12.92	11.67	10.80	10.28	11.53	11.04	12.06	13.87
37.5	10.96	9.39	9.81	10.91	10.74	9.03	8.75	8.42	7.84	9.85	9.18	7.79	7.65	9.28	8.50	9.45	10.96
40	8.38	6.67	7.21	8.13	8.41	6.11	6.41	5.49	5.00	7.34	6.27	5.14	4.81	6.66	6.12	6.77	8.38
42.5	5.23	3.86	5.12	5.78	5.75	3.52	3.51	2.70	1.94	4.27	3.71	2.48	2.04	3.44	3.05	4.01	5.23
45	2.89	1.38	2.52	3.25	3.08	1.10	0.69	0.01	0.46	1.55	0.80	0.17	0.66	0.75	0.28	1.49	2.89
47.5	0.39	1.09	0.25	0.89	0.67	1.74	2.05	2.35	3.52	1.60	2.11	2.68	3.44	1.57	2.10	1.19	0.39
50	2.03	4.06	2.59	2.22	2.08	3.84	4.39	4.76	6.14	4.11	4.74	5.69	5.70	4.27	4.32	3.80	2.03
52.5	4.94	6.12	5.53	4.41	4.33	6.19	6.58	7.32	8.40	6.82	7.23	7.99	8.18	6.59	7.01	6.40	4.94
55	7.28	8.44	7.45	6.43	6.58	8.45	8.78	9.65	10.65	9.04	9.65	10.28	10.15	8.76	8.86	8.14	7.28
57.5	9.22	10.83	9.72	8.62	8.74	10.72	10.81	11.46	13.13	11.69	12.13	12.43	12.19	11.00	10.93	10.34	9.22
60	11.88	13.06	11.73	11.23	11.07	12.50	13.24	13.87	14.58	13.48	13.84	14.58	14.45	13.17	13.24	12.55	11.88
62.5	13.33	14.79	13.66	12.75	13.24	14.28	15.04	15.83	16.11	15.55	15.97	16.16	15.84	14.52	14.85	14.21	13.33
65	15.27	16.19	15.16	14.69	14.40	15.98	16.45	17.11	17.86	17.20	17.53	17.81	17.44	16.47	16.54	15.79	15.27
67.5	16.80	17.68	16.84	16.20	16.23	17.03	17.78	18.31	19.32	18.70	19.17	19.03	18.83	17.96	17.54	17.13	16.80
70	18.34	18.75	17.76	17.21	17.57	18.81	18.87	19.67	20.63	20.13	20.31	20.03	19.85	18.86	18.84	18.31	18.34
72.5	19.31	19.99	19.44	18.47	18.90	19.38	20.28	20.57	21.43	21.28	21.16	21.18	20.65	20.43	19.84	19.65	19.31
75	20.19	20.81	20.19	19.57	19.48	20.43	20.59	21.40	22.37	22.06	22.08	22.25	21.38	20.73	20.61	20.68	20.19
77.5	21.24	21.47	20.78	20.07	20.40	20.76	21.61	21.70	22.30	22.85	22.65	22.54	21.89	21.33	20.99	21.07	21.24
80	21.16	21.31	21.20	20.58	21.06	21.48	21.84	22.00	22.59	23.42	23.29	22.76	22.25	22.16	21.69	21.70	21.16
82.5	22.21	21.64	21.12	21.42	21.23	21.24	21.77	22.15	22.88	23.64	23.50	23.04	22.62	22.38	21.84	21.70	22.21
85	21.89	21.56	21.45	21.42	21.15	21.73	21.92	22.53	22.59	23.85	23.43	23.04	22.47	22.23	21.84	21.78	21.89
87.5	22.21	21.23	21.12	21.34	21.23	21.16	21.61	21.85	22.74	23.35	23.29	22.76	22.18	22.01	21.92	21.47	22.21
90	21.65	21.14	21.12	21.25	20.81	20.59	20.98	21.33	21.94	23.28	23.15	21.90	21.53	21.78	20.99	21.62	21.65
92.5	21.48	19.99	20.53	20.83	20.65	19.79	20.44	20.80	21.14	22.64	22.29	21.39	20.65	21.33	20.38	20.68	21.48
95	20.27	19.58	19.44	20.07	19.90	19.54	19.65	20.04	19.90	21.71	21.51	20.60	20.29	20.58	19.84	19.89	20.27
97.5	19.55	18.50	18.60	19.23	19.48	18.49	18.95	19.29	18.88	20.49	20.31	19.53	18.83	19.16	18.84	18.39	19.55
100	18.90	17.27	17.76	17.80	18.07	16.79	18.01	18.01	17.93	19.63	19.17	18.02	17.95	18.34	17.46	17.76	18.90
102.5	17.69	15.94	16.76	17.13	17.23	15.90	16.13	16.81	16.19	18.42	17.60	16.80	16.05	16.92	16.46	16.50	17.69
105	16.24	14.38	15.08	15.27	15.49	14.61	15.04	14.85	14.73	16.70	16.18	14.65	14.45	15.12	14.85	15.23	16.24
107.5	14.70	12.81	13.74	13.76	13.82	12.82	13.24	13.34	12.84	15.27	14.62	13.36	12.70	13.85	13.16	13.18	14.70
110	12.36	11.08	11.64	12.50	12.49	10.72	10.97	11.38	10.80	13.41	12.56	11.50	10.80	11.98	11.24	11.37	12.36
112.5	10.83	8.68	9.47	10.64	10.66	8.37	9.17	9.20	8.62	11.05	10.43	9.28	8.83	10.10	9.09	9.63	10.83
115	8.65	6.45	7.20	8.20	8.66	6.43	6.98	6.79	6.36	9.11	8.01	7.20	6.06	7.93	6.86	7.35	8.65
117.5	6.07	4.31	5.61	6.10	6.24	3.84	4.55	4.31	3.59	6.61	6.02	4.26	3.80	5.24	5.17	5.06	6.07
120	3.89	1.42	2.59	3.07	3.58	1.57	2.05	1.67	0.75	3.96	2.75	1.60	1.32	3.14	2.10	2.85	3.89
122.5	1.14	1.38	0.26	1.30	1.00	1.02	0.69	1.04	1.36	1.10	0.34	1.12	1.89	0.45	0.21	0.33	1.14
125	1.36	4.11	3.27	1.99	1.83	4.01	3.74	4.13	4.78	1.62	2.79	4.06	4.52	2.77	3.43	2.59	1.36
127.5	4.26	7.16	6.04	4.51	5.08	6.84	6.80	6.54	7.69	4.77	5.56	7.00	7.43	5.31	6.20	5.12	4.26
130	7.09	10.13	9.23	7.88	7.58	10.16	9.85	10.15	11.19	7.84	9.11	9.94	11.01	8.31	9.73	8.51	7.09
132.5	10.40	13.35	12.08	10.91	11.08	13.07	12.82	13.32	14.24	11.21	12.31	13.53	13.93	11.60	12.73	11.58	10.40
135	13.55	16.98	15.43	14.20	14.07	16.80	16.50	16.56	17.81	14.71	15.30	17.11	17.57	15.19	15.27	15.76	13.55

In Tables 1-1 to 1-5, the experiment results of the aforementioned different thickness ratios are combined as shown in Table 2. In Table 2, when the thickness ratio of the lamp shade **20** is 1:1, the number of spatial coordinates not complying with (|I−Iavg|/Iavg)<25% is equal to 156, which is 16.68% of the total number of spatial coordinates, so that it does not meet the requirement of having at least 90% of the coordinates satisfying (|I−Iavg|/Iavg)<25%; when the thickness ratio of the lamp shade **20** is 1.7:1, the number of spatial coordinates not complying with (|I−Iavg|/Iavg)<25% is equal to 96 which is 10.26% of the total number of spatial coordinates, so that it does not meet the requirement of having at least 90% of the coordinates satisfying (|I−Iavg|/Iavg)<25%; when the thickness ratio of the lamp shade **20** is 1.8:1, the number of spatial coordinates not complying with (|I−Iavg|/Iavg)<25% is equal to 62, which is 6.63% of the total number of spatial coordinates, so that it meets the requirement of having at least 90% of the coordinates satisfying (|I−Iavg|/Iavg)<25%; when the thickness ratio of the lamp shade **20** is 3:1, the number of spatial coordinates not complying with (|I−Iavg|/Iavg)<25% is equal to 17, which is 1.81% of the total number of spatial coordinates, so that it meets the requirement of having at least 90% of the coordinates satisfying (|I−Iavg|/Iavg)<25%; and when the thickness ratio of the lamp shade **20** is 3.1:1, the number of spatial coordinates not complying with (|I−Iavg|/Iavg)<25% is equal to 145, which is 15.5% of the total number of spatial coordinates, so that it does not meet the requirement of having at least 90% of the coordinates satisfying (|I−Iavg|/Iavg)<25%.

TABLE 2

Thickness Ratio	Whether or not complies with at least 90% of the coordinate satisfying (|I − Iavg|/Iavg) < 25%	Number of Coordinates Not Complying with the Relation/Total number of Coordinates
1:1	No	156/935 = 16.68%
1.7:1	No	96/935 = 10.26%
1.8:1	Yes	62/935 = 6.63%
3:1	Yes	17/935 = 1.81%
3.1:1	No	145/935 = 15.5%

In addition to the measurement of the numeric values of the light intensity I at each spatial position within the polar coordinate positions from 0 degree to 135 degrees, and the calculation of the numeric values of the relation of the average light intensity Iavg within the polar coordinate positions from 0 degree to 135 degrees, the present invention also measures the flux of the LED light sources **211** at the polar coordinate positions from 135 degrees to 180 degrees and calculates the total flux of the LED light sources **211** to obtain the numeric value of the cumulative percentage of the total flux at the polar coordinate positions from 135 degrees to 180 degrees. Experiments are performed for different thickness ratios of the lamp shade **20**, and the experiment results are listed in Tables 3-1 to 3-5. Table 3-1 lists the experiment results for the thickness ratio of the lamp shade **20** equal to 1:1; Table 3-2 lists the experiment results for the thickness ratio of the lamp shade **20** equal to 1.7:1; Table 3-3 lists the experiment results for the thickness ratio of the lamp shade **20** equal to 1.8:1; Table 3-4 lists the experiment results for the thickness ratio of the lamp shade **20** equal to 3:1; and Table 3-5 lists the experiment results for the thickness ratio of the lamp shade **20** equal to 3.1:1, wherein γ(○) is the angle at the polar coordinate position; Average 1(cd) is the average light intensity at each angular position which is measured in the unit of candle (cd); Zonal F(lm) is the regional flux at each angular position, which is measured in the unit of lumen (lm); Sum F(lm) is the sequentially cumulative flux at each angular position, which is measured in the unit of lumen (Im); Eff Fiux(%) is the percentage (%) of the flux at each angular position with respect to the total flux; and Eff Sum(%) is the cumulative percentage of the flux at each angular position with respect to the total flux, which is measured in the unit of percent (%).

TABLE 3-1

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
0.0	87.230	.000	.000	.000%	.000%
2.5	87.216	.522	.522	.066%	.066%
5.0	87.130	1.563	2.085	.198%	.264%
7.5	87.037	2.599	4.683	.329%	.594%
10.0	86.861	3.626	8.309	.460%	1.053%
12.5	86.655	4.640	12.949	.588%	1.641%
15.0	86.392	5.638	18.587	.715%	2.356%
17.5	86.153	6.618	25.205	.839%	3.195%
20.0	85.825	7.577	32.782	.960%	4.155%
22.5	85.473	8.510	41.292	1.079%	5.234%
25.0	85.109	9.417	50.709	1.194%	6.427%
27.5	84.659	10.292	61.001	1.304%	7.732%
30.0	84.277	11.138	72.138	1.412%	9.143%
32.5	83.873	11.957	84.095	1.515%	10.659%
35.0	83.526	12.747	96.842	1.616%	12.275%
37.5	83.208	13.514	110.356	1.713%	13.987%
40.0	82.840	14.246	124.602	1.806%	15.793%
42.5	82.417	14.935	139.537	1.893%	17.686%
45.0	81.999	15.584	155.121	1.975%	19.661%
47.5	81.603	16.199	171.319	2.053%	21.714%
50.0	81.204	16.778	188.097	2.127%	23.841%
52.5	80.703	17.307	205.404	2.194%	26.035%
55.0	80.253	17.792	223.196	2.255%	28.290%
57.5	79.594	18.217	241.413	2.309%	30.599%
60.0	78.973	18.581	259.994	2.355%	32.954%
62.5	78.376	18.909	278.902	2.397%	35.350%
65.0	77.674	19.183	298.086	2.431%	37.782%
67.5	76.876	19.390	317.475	2.458%	40.239%
70.0	76.068	19.538	337.014	2.476%	42.716%
72.5	75.266	19.642	356.656	2.490%	45.205%
75.0	74.341	19.687	376.343	2.495%	47.701%
77.5	73.365	19.665	396.008	2.493%	50.193%
80.0	72.402	19.596	415.604	2.484%	52.677%
82.5	71.268	19.463	435.067	2.467%	55.144%
85.0	70.224	19.279	454.346	2.444%	57.587%
87.5	69.042	19.048	473.394	2.414%	60.002%
90.0	67.900	18.766	492.160	2.379%	62.380%
92.5	66.661	18.440	510.599	2.337%	64.717%
95.0	65.384	18.060	528.659	2.289%	67.006%
97.5	64.090	17.641	546.301	2.236%	69.242%
100.0	62.672	17.173	563.473	2.177%	71.419%
102.5	61.267	16.662	580.135	2.112%	73.531%

TABLE 3-1-continued

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
105.0	59.714	16.107	596.242	2.042%	75.572%
107.5	58.227	15.520	611.762	1.967%	77.539%
110.0	56.712	14.918	626.680	1.891%	79.430%
112.5	55.033	14.275	640.955	1.809%	81.240%
115.0	53.468	13.612	654.568	1.725%	82.965%
117.5	51.763	12.936	667.504	1.640%	84.605%
120.0	50.108	12.242	679.746	1.552%	86.156%
122.5	48.297	11.531	691.277	1.462%	87.618%
125.0	46.567	10.811	702.088	1.370%	88.988%
127.5	44.788	10.098	712.187	1.280%	90.268%
130.0	43.012	9.385	721.527	1.190%	91.458%
132.5	41.214	8.680	730.252	1.100%	92.558%
135.0	39.375	7.979	738.231	1.011%	93.569%
137.5	37.648	7.301	745.531	.925%	94.494%
140.0	35.950	6.651	752.183	.843%	95.337%
142.5	34.166	6.015	758.198	.762%	96.100%
145.0	32.490	5.402	763.601	.685%	96.785%
147.5	30.798	4.819	768.420	.611%	97.396%
150.0	29.000	4.252	772.672	.539%	97.934%
152.5	27.237	3.708	776.380	.470%	98.404%
155.0	25.087	3.172	779.552	.402%	98.806%
157.5	22.776	2.642	782.194	.335%	99.141%
160.0	20.135	2.132	784.326	.270%	99.412%
162.5	17.534	1.660	785.985	.210%	99.622%
165.0	14.779	1.239	787.225	.157%	99.779%
167.5	11.544	.858	788.082	.109%	99.888%
170.0	8.035	.524	788.606	.066%	99.954%
172.5	4.195	.255	788.861	.032%	99.986%
175.0	1.220	.081	788.942	.010%	99.997%
177.5	1.047	.020	788.962	.003%	99.999%
180.0	1.052	.006	788.968	.001%	100.000%

TABLE 3-2

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
0.0	72.256	.000	.000	.000%	.000%
2.5	72.280	.432	.432	.054%	.054%
5.0	72.361	1.297	1.729	.163%	.218%
7.5	72.397	2.160	3.889	.272%	.490%
10.0	72.548	3.022	6.911	.381%	.871%
12.5	72.668	3.883	10.794	.489%	1.361%
15.0	72.871	4.741	15.536	.598%	1.958%
17.5	73.137	5.600	21.136	.706%	2.664%
20.0	73.338	6.453	27.589	.813%	3.477%
22.5	73.582	7.299	34.888	.920%	4.397%
25.0	73.845	8.138	43.027	1.026%	5.423%
27.5	74.119	8.970	51.997	1.131%	6.554%
30.0	74.441	9.794	61.791	1.234%	7.788%
32.5	74.832	10.614	72.405	1.338%	9.126%
35.0	75.206	11.425	83.830	1.440%	10.566%
37.5	75.580	12.221	96.052	1.540%	12.106%
40.0	75.846	12.991	109.043	1.637%	13.744%
42.5	76.139	13.736	122.779	1.731%	15.475%
45.0	76.432	14.461	137.240	1.823%	17.298%
47.5	76.640	15.156	152.396	1.910%	19.208%
50.0	76.811	15.814	168.209	1.993%	21.201%
52.5	76.933	16.435	184.644	2.071%	23.273%
55.0	76.993	17.015	201.659	2.145%	25.417%
57.5	76.993	17.549	219.208	2.212%	27.629%
60.0	76.933	18.037	237.245	2.273%	29.902%
62.5	76.809	18.475	255.720	2.329%	32.231%
65.0	76.627	18.862	274.582	2.377%	34.608%
67.5	76.258	19.181	293.763	2.418%	37.026%
70.0	75.992	19.450	313.213	2.451%	39.477%
72.5	75.531	19.667	332.879	2.479%	41.956%
75.0	75.008	19.810	352.689	2.497%	44.453%
77.5	74.422	19.895	372.584	2.508%	46.961%
80.0	73.709	19.914	392.498	2.510%	49.471%
82.5	73.020	19.878	412.375	2.505%	51.976%
85.0	72.212	19.788	432.164	2.494%	54.470%
87.5	71.344	19.635	451.798	2.475%	56.945%
90.0	70.346	19.417	471.215	2.447%	59.392%

TABLE 3-2-continued

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
92.5	69.405	19.151	490.366	2.414%	61.806%
95.0	68.296	18.834	509.200	2.374%	64.180%
97.5	67.220	18.464	527.664	2.327%	66.507%
100.0	66.029	18.051	545.716	2.275%	68.782%
102.5	64.757	17.582	563.298	2.216%	70.998%
105.0	63.518	17.078	580.376	2.153%	73.151%
107.5	62.111	16.532	596.908	2.084%	75.234%
110.0	60.774	15.950	612.857	2.010%	77.245%
112.5	59.272	15.335	628.193	1.933%	79.178%
115.0	57.775	14.684	642.877	1.851%	81.028%
117.5	56.210	14.012	656.890	1.766%	82.795%
120.0	54.594	13.315	670.205	1.678%	84.473%
122.5	53.037	12.612	682.817	1.590%	86.063%
125.0	51.283	11.889	694.706	1.498%	87.561%
127.5	49.563	11.147	705.853	1.405%	88.966%
130.0	47.860	10.414	716.268	1.313%	90.279%
132.5	46.125	9.685	725.953	1.221%	91.499%
135.0	44.281	8.951	734.904	1.128%	92.628%
137.5	42.640	8.239	743.143	1.038%	93.666%
140.0	40.861	7.546	750.689	.951%	94.617%
142.5	39.063	6.857	757.546	.864%	95.481%
145.0	37.401	6.197	763.743	.781%	96.262%
147.5	35.587	5.558	769.302	.701%	96.963%
150.0	33.764	4.931	774.233	.622%	97.585%
152.5	31.698	4.316	778.549	.544%	98.129%
155.0	29.436	3.706	782.255	.467%	98.596%
157.5	26.820	3.106	785.360	.391%	98.987%
160.0	23.980	2.524	787.884	.318%	99.305%
162.5	20.897	1.977	789.861	.249%	99.554%
165.0	17.659	1.479	791.340	.186%	99.741%
167.5	13.497	1.015	792.355	.128%	99.869%
170.0	9.787	.623	792.978	.078%	99.947%
172.5	4.629	.301	793.278	.038%	99.985%
175.0	1.391	.090	793.368	.011%	99.996%
177.5	1.082	.022	793.390	.003%	99.999%
180.0	1.047	.006	793.397	.001%	100.000%

TABLE 3-3

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
0.0	66.257	.000	.000	.000%	.000%
2.5	66.246	.396	.396	.050%	.050%
5.0	66.319	1.188	1.585	.150%	.200%
7.5	66.479	1.982	3.566	.251%	.451%
10.0	66.648	2.776	6.342	.351%	.802%
12.5	66.943	3.572	9.914	.452%	1.254%
15.0	67.231	4.371	14.286	.553%	1.807%
17.5	67.616	5.172	19.458	.654%	2.461%
20.0	68.052	5.977	25.435	.756%	3.217%
22.5	68.584	6.788	32.223	.859%	4.076%
25.0	69.091	7.600	39.823	.961%	5.037%
27.5	69.658	8.411	48.234	1.064%	6.101%
30.0	70.233	9.223	57.457	1.167%	7.268%
32.5	70.881	10.034	67.491	1.269%	8.537%
35.0	71.458	10.839	78.330	1.371%	9.908%
37.5	72.120	11.637	89.967	1.472%	11.381%
40.0	72.801	12.433	102.400	1.573%	12.953%
42.5	73.384	13.211	115.612	1.671%	14.624%
45.0	73.942	13.964	129.576	1.766%	16.391%
47.5	74.425	14.690	144.266	1.858%	18.249%
50.0	74.927	15.391	159.657	1.947%	20.196%
52.5	75.342	16.063	175.720	2.032%	22.228%
55.0	75.664	16.692	192.412	2.111%	24.339%
57.5	75.860	17.269	209.681	2.184%	26.524%
60.0	76.079	17.804	227.485	2.252%	28.776%
62.5	76.160	18.295	245.779	2.314%	31.090%
65.0	76.166	18.726	264.505	2.369%	33.459%
67.5	76.095	19.103	283.608	2.416%	35.875%
70.0	75.897	19.417	303.024	2.456%	38.332%
72.5	75.624	19.666	322.691	2.488%	40.819%
75.0	75.312	19.862	342.552	2.512%	43.332%
77.5	74.805	19.986	362.539	2.528%	45.860%

TABLE 3-3-continued

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
80.0	74.262	20.040	382.578	2.535%	48.395%
82.5	73.636	20.036	402.614	2.534%	50.929%
85.0	72.952	19.973	422.587	2.527%	53.456%
87.5	72.049	19.832	442.420	2.509%	55.965%
90.0	71.236	19.635	462.055	2.484%	58.448%
92.5	70.224	19.385	481.440	2.452%	60.900%
95.0	69.235	19.074	500.514	2.413%	63.313%
97.5	68.139	18.717	519.231	2.368%	65.681%
100.0	67.030	18.312	537.543	2.316%	67.997%
102.5	65.755	17.851	555.394	2.258%	70.255%
105.0	64.467	17.338	572.732	2.193%	72.448%
107.5	63.109	16.788	589.519	2.124%	74.572%
110.0	61.669	16.195	605.715	2.049%	76.621%
112.5	60.185	15.567	621.281	1.969%	78.590%
115.0	58.621	14.905	636.186	1.885%	80.475%
117.5	57.148	14.232	650.418	1.800%	82.276%
120.0	55.413	13.526	663.945	1.711%	83.987%
122.5	53.805	12.798	676.743	1.619%	85.606%
125.0	52.091	12.069	688.811	1.527%	87.132%
127.5	50.388	11.328	700.139	1.433%	88.565%
130.0	48.622	10.584	710.723	1.339%	89.904%
132.5	46.927	9.847	720.569	1.246%	91.149%
135.0	44.997	9.102	729.671	1.151%	92.301%
137.5	43.394	8.378	738.049	1.060%	93.361%
140.0	41.564	7.678	745.727	.971%	94.332%
142.5	39.730	6.974	752.701	.882%	95.214%
145.0	38.079	6.306	759.008	.798%	96.012%
147.5	36.311	5.665	764.672	.717%	96.728%
150.0	34.488	5.034	769.707	.637%	97.365%
152.5	32.224	4.398	774.105	.556%	97.922%
155.0	29.651	3.751	777.856	.474%	98.396%
157.5	27.571	3.159	781.015	.400%	98.796%
160.0	26.028	2.663	783.677	.337%	99.132%
162.5	24.851	2.242	785.919	.284%	99.416%
165.0	23.085	1.839	787.758	.233%	99.649%
167.5	19.419	1.385	789.142	.175%	99.824%
170.0	12.526	.854	789.997	.108%	99.932%
172.5	5.833	.383	790.380	.048%	99.980%
175.0	1.882	.115	790.495	.015%	99.995%
177.5	1.665	.032	790.526	.004%	99.999%
180.0	1.708	.010	790.536	.001%	100.000%

TABLE 3-4

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
0.0	47.399	.000	.000	.000%	.000%
2.5	47.535	.284	.284	.039%	.039%
5.0	47.662	.853	1.137	.116%	.155%
7.5	47.885	1.426	2.563	.194%	.349%
10.0	48.289	2.005	4.568	.273%	.623%
12.5	48.793	2.596	7.164	.354%	.977%
15.0	49.384	3.199	10.363	.436%	1.412%
17.5	50.152	3.818	14.181	.520%	1.933%
20.0	50.854	4.450	18.631	.607%	2.539%
22.5	51.608	5.090	23.721	.694%	3.233%
25.0	52.465	5.745	29.466	.783%	4.016%
27.5	53.455	6.421	35.887	.875%	4.892%
30.0	54.393	7.110	42.997	.969%	5.861%
32.5	55.527	7.816	50.813	1.065%	6.926%
35.0	56.788	8.553	59.366	1.166%	8.092%
37.5	57.870	9.293	68.659	1.267%	9.358%
40.0	59.065	10.032	78.691	1.367%	10.726%
42.5	60.242	10.782	89.474	1.470%	12.196%
45.0	61.436	11.533	101.007	1.572%	13.768%
47.5	62.471	12.268	113.275	1.672%	15.440%
50.0	63.507	12.982	126.257	1.770%	17.209%
52.5	64.538	13.688	139.945	1.866%	19.075%
55.0	65.465	14.370	154.315	1.959%	21.034%
57.5	66.363	15.024	169.339	2.048%	23.082%
60.0	67.081	15.637	184.976	2.131%	25.213%
62.5	67.833	16.213	201.189	2.210%	27.423%
65.0	68.486	16.758	217.947	2.284%	29.707%

TABLE 3-4-continued

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
67.5	68.953	17.243	235.190	2.350%	32.057%
70.0	69.389	17.673	252.863	2.409%	34.466%
72.5	69.704	18.053	270.916	2.461%	36.927%
75.0	69.915	18.373	289.288	2.504%	39.431%
77.5	70.007	18.629	307.918	2.539%	41.970%
80.0	70.005	18.822	326.740	2.566%	44.536%
82.5	69.921	18.956	345.696	2.584%	47.120%
85.0	69.777	19.034	364.730	2.594%	49.714%
87.5	69.473	19.046	383.776	2.596%	52.310%
90.0	68.993	18.975	402.750	2.586%	54.896%
92.5	68.554	18.849	421.599	2.569%	57.465%
95.0	67.911	18.665	440.264	2.544%	60.010%
97.5	67.239	18.414	458.678	2.510%	62.520%
100.0	66.439	18.110	476.788	2.468%	64.988%
102.5	65.566	17.746	494.534	2.419%	67.407%
105.0	64.606	17.331	511.864	2.362%	69.769%
107.5	63.551	16.864	528.729	2.299%	72.068%
110.0	62.393	16.347	545.075	2.228%	74.296%
112.5	61.156	15.783	560.858	2.151%	76.447%
115.0	59.841	15.180	576.039	2.069%	78.516%
117.5	58.379	14.533	590.572	1.981%	80.497%
120.0	56.912	13.855	604.426	1.888%	82.386%
122.5	55.377	13.158	617.584	1.793%	84.179%
125.0	53.745	12.436	630.021	1.695%	85.874%
127.5	51.982	11.687	641.707	1.593%	87.467%
130.0	50.168	10.919	652.627	1.488%	88.955%
132.5	48.405	10.158	662.785	1.385%	90.340%
135.0	46.485	9.395	672.180	1.281%	91.621%
137.5	44.788	8.651	680.832	1.179%	92.800%
140.0	42.768	7.913	688.744	1.079%	93.878%
142.5	40.804	7.170	695.914	.977%	94.856%
145.0	38.895	6.460	702.374	.880%	95.736%
147.5	36.972	5.777	708.151	.787%	96.524%
150.0	35.012	5.119	713.270	.698%	97.221%
152.5	33.138	4.493	717.763	.612%	97.834%
155.0	31.074	3.893	721.656	.531%	95.364%
157.5	29.011	3.317	724.972	.452%	98.816%
160.0	26.361	2.751	727.723	.375%	99.191%
162.5	23.381	2.192	729.915	.299%	99.490%
165.0	19.430	1.642	731.557	.224%	99.714%
167.5	13.971	1.088	732.645	.148%	99.862%
170.0	8.952	.613	733.258	.084%	99.946%
172.5	4.328	.277	733.535	.038%	99.984%
175.0	1.510	.087	733.622	.012%	99.995%
177.5	1.315	.025	733.647	.003%	99.999%
180.0	1.313	.008	733.655	.001%	100.000%

TABLE 3-5

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
0.0	37.827	.000	.000	.000%	.000%
2.5	37.873	.226	.226	.032%	.032%
5.0	38.087	.681	.907	.096%	.128%
7.5	38.353	1.141	2.048	.161%	.289%
10.0	38.879	1.610	3.658	.227%	.516%
12.5	39.465	2.095	5.753	.296%	.812%
15.0	40.235	2.597	8.350	.366%	1.178%
17.5	41.067	3.118	11.468	.440%	1.618%
20.0	42.025	3.661	15.129	.516%	2.134%
22.5	43.006	4.224	19.353	.596%	2.730%
25.0	44.110	4.809	24.162	.678%	3.409%
27.5	45.317	5.421	29.584	.765%	4.173%
30.0	46.572	6.058	35.642	.855%	5.028%
32.5	47.990	6.724	42.366	.949%	5.976%
35.0	49.544	7.427	49.793	1.048%	7.024%
37.5	51.036	8.152	57.945	1.150%	8.174%
40.0	52.535	8.886	66.831	1.253%	9.428%
42.5	54.103	9.637	76.468	1.360%	10.787%
45.0	55.578	10.396	86.864	1.467%	12.254%
47.5	57.064	11.153	98.017	1.573%	13.827%
50.0	58.504	11.910	109.927	1.680%	15.507%
52.5	59.884	12.655	122.582	1.785%	17.292%

TABLE 3-5-continued

γ (°)	Average I (cd)	Zonal F (lm)	Sum F (lm)	Eff Flux (%)	Eff Sum (%)
55.0	61.099	13.373	135.955	1.887%	19.179%
57.5	62.344	14.068	150.023	1.985%	21.164%
60.0	63.551	14.752	164.776	2.081%	23.245%
62.5	64.522	15.390	180.166	2.171%	25.416%
65.0	65.427	15.975	196.141	2.254%	27.669%
67.5	66.222	16.517	212.658	2.330%	29.999%
70.0	66.902	17.006	229.664	2.399%	32.398%
72.5	67.532	17.449	247.113	2.461%	34.860%
75.0	67.984	17.833	264.945	2.516%	37.375%
77.5	68.291	18.144	283.089	2.559%	39.935%
80.0	68.532	18.394	301.482	2.595%	42.530%
82.5	68.668	18.587	320.069	2.622%	45.152%
85.0	68.684	18.715	338.784	2.640%	47.792%
87.5	68.562	18.772	357.555	2.648%	50.440%
90.0	68.334	18.760	376.315	2.646%	53.086%
92.5	67.979	18.680	394.994	2.635%	55.721%
95.0	67.551	18.537	413.531	2.615%	58.336%
97.5	66.973	18.329	431.860	2.586%	60.922%
100.0	66.355	18.062	449.922	2.548%	63.470%
102.5	65.633	17.744	467.666	2.503%	65.973%
105.0	64.730	17.356	485.023	2.448%	68.421%
107.5	63.830	16.917	501.940	2.387%	70.808%
110.0	62.759	16.430	518.370	2.318%	73.126%
112.5	61.606	15.887	534.258	2.241%	75.367%
115.0	60.348	15.300	549.558	2.158%	77.525%
117.5	59.027	14.675	564.233	2.070%	79.595%
120.0	57.536	14.007	578.240	1.976%	81.571%
122.5	56.072	13.313	591.553	1.878%	83.449%
125.0	54.396	12.590	604.143	1.776%	85.225%
127.5	52.804	11.850	615.992	1.672%	86.897%
130.0	50.995	11.096	627.088	1.565%	88.462%
132.5	49.222	10.328	637.415	1.457%	89.919%
135.0	47.302	9.557	646.972	1.348%	91.267%
137.5	45.504	8.796	655.769	1.241%	92.508%
140.0	43.589	8.052	663.821	1.136%	93.644%
142.5	41.623	7.311	671.131	1.031%	94.675%
145.0	39.598	6.583	677.714	.929%	95.604%
147.5	37.599	5.879	683.593	.829%	96.433%
150.0	35.481	5.196	688.789	.733%	97.166%
152.5	33.246	4.531	693.320	.639%	97.806%
155.0	30.819	3.884	697.204	.548%	98.353%
157.5	28.064	3.251	700.455	.459%	98.812%
160.0	25.103	2.641	703.096	.373%	99.185%
162.5	22.112	2.080	705.176	.293%	99.478%
165.0	18.554	1.560	706.736	.220%	99.698%
167.5	14.215	1.068	707.803	.151%	99.849%
170.0	9.385	.631	708.434	.089%	99.938%
172.5	5.353	.307	708.742	.043%	99.981%
175.0	1.605	.104	708.846	.015%	99.996%
177.5	1.077	.024	708.870	.003%	99.999%
180.0	1.068	.006	708.876	.001%	100.000%

From the numeric values listed in the cumulative fields of the flux at each angular position with respect to the total flux as shown in Tables 3-1 to 3-5, we know that when the thickness ratio of the lamp shade **20** is 1:1, the flux of the polar coordinate positions from 135 degrees to 180 degrees is approximately equal to 6.431% of the total flux of the LED light sources **211**; when the thickness ratio of the lamp shade **20** is 1.7:1, the flux of the polar coordinate positions from 135 degrees to 180 degrees is approximately equal to 7.372% of the total flux of the LED light sources **211**; when the thickness ratio of the lamp shade **20** is 1.8:1, the flux of the polar coordinate positions from 135 degrees to 180 degrees is approximately equal to 7.699% of the total flux of the LED light sources **211**; when the thickness ratio of the lamp shade **20** is 3:1, the flux of the polar coordinate positions from 135 degrees to 180 degrees is approximately equal to 8.379% of the total flux of the LED light sources **211**; and when the thickness ratio of the lamp shade **20** is 3.1:1, the flux of the polar coordinate positions from 135 degrees to 180 degrees is approximately equal to 8.733% of the total flux of the LED light sources **211**. Although the flux of the testing items can reach up to 5% of the total flux of the LED light source **21** at the polar coordinate position from 135 degrees to 180 degrees provided that the thickness ratio of the lamp shade **20** is 1:1, 1.7:1, 1.8:1, 3:1 or 3.1:1, yet the present invention is characterized in that the axially symmetric LED light bulb **2** not just achieves a brightness with a flux equal to 5% of the total flux of the LED light sources **211** at the polar coordinate position from 135 degrees to 180 degrees only, but also satisfy the relation $(|I-Iavg|/Iavg)<25\%$, wherein, I is an intensity of light of at least 90% of a spatial position between the polar coordinate positions from 0 degree to 135 degrees, and Iavg is an average light intensity between the polar coordinate positions from 0 degree to 135 degrees. With reference to the aforementioned experiment results, the expected illumination effect of the present invention has not been achieved when the lamp shade **20** has a thickness ratio of 1:1, 1.7:1 or 3.1:1.

With reference to FIGS. **8-12** for different light polar radiation patterns drawn according to the experiment results respectively, these figures show the sectional light intensity distributions at the polar coordinate positions 0 degree and 180 degrees and the polar coordinate position 90 degrees and 270 degrees of the axially symmetric LED light bulb **2** respectively. In FIGS. **8-12**, L_A represents the light curve formed on a plane composed of the polar coordinate positions 0 degree and 180 degrees, and L_B represents the light curve formed on a plane composed of the polar coordinate positions 90 degrees and 270 degrees. FIG. **8** shows a light polar radiation pattern of the lamp shade **20** with a thickness ratio of 1:1, FIG. **9** shows a light polar radiation pattern of the lamp shade **20** with a thickness ratio of 1.7:1, FIG. **10** shows a light polar radiation pattern of the lamp shade **20** with a thickness ratio of 1.8:1, FIG. **11** shows a light polar radiation pattern of the lamp shade **20** with a thickness ratio of 3:1, and FIG. **12** shows a light polar radiation pattern of the lamp shade **20** with a thickness ratio of 3.1:1. The se light polar radiation patterns show that both of the best light illumination range and uniformity will be achieved if the lamp shade **20** has the thickness ratios of 1.8:1 and 3:1, so that the LED light bulb with an LED light source can achieve an illumination effect similar to the full circumferential illumination effect. To achieve the expected full circumferential illumination effect, the present invention maintains a specific light emitting intensity and combines with the aforementioned experiment results to limit the thickness of the lamp shade **20** in a range of the polar coordinate +30 degrees to −30 degrees with respect to the polar coordinate +90 degrees to +30 degrees and −90 degrees to −30 degrees to a ratio of (1.8-3):**1**, so that the axially symmetric LED light bulb **2** satisfies the aforementioned flux and light emitting intensity conditions and achieves the best light emitting efficiency and uniformity.

Preferably, the edge of a sectional line on an inner side of the lamp shade **20** is an arc, or a curve having a plurality of turning points, wherein the curve is laterally symmetrical. In this preferred embodiment, the edge of the sectional line on the inner side of the lamp shade **20** is an arc. In addition, the distance L from the top of the inner side of the lamp shade **20** to the substrate **21** is 50 mm-60 mm, and the maximum width W of the external periphery of the lamp shade **20** is 58 mm-70 mm.

In summation of the description above, the present invention focuses at the LED light bulbs with a light emitting surface that faces upward, and makes use of the lamp shade **20** of unequal thickness to reduce the light intensity of the LED light sources **211** at specific angles to scatter the light to predetermined light output angle and achieve a uniform light emitting effect and a wide-angle illumination range, so as to overcome the drawbacks of the conventional LED light bulb including non-uniform light emission and too-concentrated light angle effectively.

What is claimed is:

1. An axially symmetric LED light bulb, comprising a lamp shade, a substrate and a connecting seat, and the substrate being installed on the connecting seat and having a plurality of LED light sources, and an edge of the lamp shade being coupled to the connecting seat and the substrate being covered inside the lamp shade, characterized in that the lamp shade has an unequal thickness, and the thickness of the top of the lamp shade is greater than the thickness of the lateral side of the lamp shade, such that the LED light sources are arranged at a polar coordinate origin position, and when the illumination of LED light source points at a direction towards the polar coordinate 0 degree and after the light of the LED light source passes through the lamp shade, at least 5% of the total flux of the LED light source is obtained at the polar coordinate positions from 135 degrees to 180 degrees; and the light of the LED light source passes through the lamp shade satisfies $(|I-Iavg|/Iavg)<25\%$, wherein, I is an intensity of light of at least 90% of a spatial position between the polar coordinate positions from 0 degree to 135 degrees, and Iavg is an average light intensity between the polar coordinate positions from 0 degree to 135 degrees.

2. The axially symmetric LED light bulb as claimed in claim **1**, wherein the ratio of the thickness of the lamp shade at the polar coordinates from +30 degrees to −30 degrees to the thickness of the lamp shade at the polar coordinates from +90 degrees to +30 degrees and from −90 degrees to −30 degrees is equal to (1.8-3):1.

3. The axially symmetric LED light bulb as claimed in claim **2**, wherein the lamp shade has an arc-shaped cross-sectional edge formed on the inner side of the lamp shade.

4. The axially symmetric LED light bulb as claimed in claim **3**, wherein the inner top end of the inner side of the lamp shade is 50 mm-60 mm apart from the substrate.

5. The axially symmetric LED light bulb as claimed in claim **4**, wherein the lamp shade has an external periphery with a maximum width equal to 58 mm-70 mm.

6. The axially symmetric LED light bulb as claimed in claim **2**, wherein the arc-shaped cross-sectional edge formed on the inner side of the lamp shade is a curve with a plurality of turning points, and the curve is bilaterally symmetrical.

7. The axially symmetric LED light bulb as claimed in claim **6**, wherein the inner top end of the inner side of the lamp shade is 50 mm-60 mm apart from the substrate.

8. The axially symmetric LED light bulb as claimed in claim **7**, wherein the lamp shade has an external periphery with a maximum width equal to 58 mm-70 mm.

* * * * *